ARCHIVES OF OTOLOGY.

TWO CASES OF OTITIC LATERAL-SINUS DISEASE; OPERATIONS, WITH LIGATION OF THE JUGULAR.[1]

By Dr. O. JOACHIM, New Orleans, La.

Case 1.—E. C., white, male, age twenty-four, admitted to hospital October 10, 1899—died October 24th. Native of Louisiana; bricklayer, married, father of two healthy children; had rheumatism when twelve years old; denies venereal trouble; mother died of phthisis. Data obtained from his wife, patient unable to answer questions satisfactorily.

Has had ear trouble since childhood, both ears being alternately troublesome without incapacitating him from work until three weeks after a recrudescence of the discharge in the right ear, about three months previous. The first unusual manifestations were pain in the head near the affected ear, a rise of temperature, preceded by a chill and general malaise; increase of fever in the afternoon, sleepless nights, no desire for food, and profuse sweats. These symptoms increased steadily in intensity. When admitted to hospital, the following status was noted: Temperature, 102°. Pulse, 135, of poor quality. Poorly nourished, muddy and pasty color, sordes upon teeth; tongue coated, pointed, and dry; eyes droopy and expressionless. Right pupil responds slowly to light and slightly more dilated than left. The general cast is one of intense sepsis with mental involvement. Extremely restless, answers inquiries slowly and inaccurately. Pronounced rigidity of neck. Tenderness over mastoid, which is red and swollen; intense pain in head; talking at random, continually groaning; profuse perspiration alternating with hot skin; purulent middle-ear discharge possessing an odor; the region between the angle of the inferior maxillary and the mastoid process swollen and tender,

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extending in direction of the internal jugular. Membrana tympani not inflamed, perforated in upper posterior quadrant, freely discharging fœtid pus. No sinking of upper wall, and disease in the tympanic cavity apparently limited, ossicles intact; functional examination not practicable. Thorax and contents normal. Kidneys and other organs apparently normal. Condition of the spleen not noted. *Diagnosis* of pyæmia from peri- and endophlebitis of otitic origin was certain; cerebellar abscess was thought of.

Operation, October 12th, the second day after admission, after preparatory treatment and proper preparation. House Surgeon, Dr. J. D. Bloom, assisted in operation and ligated internal jugular.

Operation:—Usual incision to a point one half inch below mastoid; from the middle of the incision, at right angles to it, another incision backward for two inches. In the subsequent steps of the operation as usually performed, we have only to mention an eburnized cortex and small superficial cells. In the deeply located mastoid antrum, very fœtid accumulations. Osseous wound enlarged backward, following the accumulation extending in that direction, and thereby freeing a large perisinual pus accumulation. At this point the lateral sinus was laid bare freely. Beyond the sinus, another accumulation of pus confined by smooth-walled membrane, the size of a hazel-nut, was evacuated. Bony wound enlarged freely in direction of axis of sinus. The posterior osseous wall of the external auditory meatus was removed, properly safeguarding the facial nerve. The aditus was freed, the antrum laid open, and the lateral wall of the attic removed. The dura was laid bare 1½ inches directly over the external auditory meatus to examine under surface of the temporal lobe for extradural accumulations or fistulous tracts. The parts appeared normal. Insertion of trochar into the lateral sinus showed fluid fœtid pus of light chocolate color. The internal jugular was ligated below the omohyoid muscle before proceeding further. The walls were found to be inflamed, matted, and with difficulty recognizable. Cut between two ligatures the contents of the vein proved identical with the contents of the sinus. Syringed out freely from below upward, and vice versa. Resection of vein for about three inches upward. Proximal end of jugular left undisturbed. The distal end of lateral sinus was found occluded by a cord-like, tough mass of fibrin. The patient showing signs of collapse was infused, with improvement of pulse.

While this was done the wounds were thoroughly cleansed, the bony edges smoothed, the lower wound sutured, the upper dressed as an open wound, and patient put to bed.

The patient survived the intense shock of the operation; the symptoms of pyæmia, however, persisted. On the second day patient spoke rationally; incontinence of urine subsided; nourished well. Still the pulse ranged between 110 and 140. Temperature between 101°–104°. On the third day mental condition not as good as day before. Temperature between 100°–100.6°. Pulse, 88–100. The pyæmia persisting, the wounds were opened on the third day. The upper looked in every way as it should, the lower wound was distended with pus. From the proximal end of the jugular from which the ligature had slipped pus poured out freely. After proper cleansing and dressing, some hope was entertained of having eliminated the pyæmic focus.

Next day's temperature and pulse showed persistence of pyæmic infection. Upper wound satisfactory, lower wound discharging pus freely from proximal and distal ends of internal jugular. In the centre of the exposed dura covering the cerebellum a small drop of pus appeared. On the sixth day a thorough search was made for the pyæmic focus in the exposed cerebral regions. We failed to find pus at the internal auditory meatus, or in the temporal lobe, or in the cerebellum at the place where the small drop had been noticed on the dura the day before. With all the attention which the patient and the case deserved, the condition went from bad to worse, with symptoms of increasing pyæmic infection, pulmonic complications, increasing stupor.

Patient died October 24th, twelve days after operation.

Post-mortem: Emaciated body of white male. Conjunctiva normal; pupils dilated; bed-sores absent. Numerous small ecchymotic spots over chest and epigastrium; œdema of right temporal region. Small pus accumulations over mastoid emissary. Wound of operation over mastoid, wound of operation over right side of neck from level of upper border of thyroid to within one inch of clavicle over course of jugular vein; wound of infusion.

Lungs: Metastatic abscesses in great number from pea to bean size in right lung; few in left lung, posteriorly on lower and upper portion of lower lobe; none at apex. Lower lobe of right lung presents first stage of pneumonia; middle lobe second stage; spleen much enlarged.

Cranial Cavity: Great increase of cerebro-spinal fluid. Brain substance normal in consistency but congested; congestion of velum interpositum; right lateral sinus thrombosis; few drops of pus between dura and bone under the sigmoid sinus. Small quantity of pus in foramen ovale. Dura normal except over wound of operation, where it is covered with pale granulation and has a very small opening about middle of each exposed area corresponding to exploratory punctures, with normal conditions surrounding the puncture of the temporal lobe. The opening in the cerebellar dura corresponds to a minute loss in the substance of the cerebellum (whence the small drop of pus appeared for some days). The defect is about the size of point of a thick probe without radius of reaction. The meningeal veins much distended. No cloudiness of the membranes, not at the seat of operation nor at the base; ventricles free, no cerebral or cerebellar abscess. The lateral sinus thrombosed on right side to torcular Herophili with fibrous tough white exudate. Sigmoid sinus collapsed. At foramen jugular pus is encountered in large quantity. Accumulations contained in smooth-walled pockets extended from this point and could be followed in large quantity to behind the œsophagus, under the deep muscles of the neck along the sheath and within the jugular vein and into the vertebral canal. The proximal end of the jugular contains pus and no occluding thrombus. Its wall is whitish gray, thickened, and fatty in appearance.

Specimen: The upper surface of the petrous portion presents several points where the necrosis of the bone extends to its surface without as yet infecting the dural membrane at these points: at the post. surface the diseased bone extending to and beyond the sinus is removed, where it forms the bony bed of the vessel. The jugular foramen when first examined was full of pus, which was dislodged in examination. The dura shows the thrombosed vein with its fibrous contents extending to the torcular Herophili.

Case 2.—P. R., æt. 18, white, male, admitted from outdoor department, December 4, 1899, with following history: Acquired first pain in right ear in 1898, after swimming and diving, followed by bloody discharge. Was operated in the ear under chloroform anæsthesia at one of the institutions in the city, where he had applied for relief. In from four to six weeks, recovery. In the following year, he had a similar attack from the same cause, the discharge from the ear being without blood. At this time cocaine was used for some operative interference; discharge stopped after

four to six weeks. Since then discharge of fœtid pus at intervals. Five or six months ago had earache for four or five hours. Next earache occurred ten days ago, after a slight accidental hit by an iron pipe on back of head on the right side. Pain began half an hour after contusion, to which he had paid no attention. Pain increased gradually to great severity. Fever began four days previous, coincident with swelling behind the ear. Worked at his trade of plumbing until that time. First chill occurred day previous to his visit. Double vision of objects for two days before his application for relief. The chill on preceding evening was followed by fever and profuse perspiration. The head bent toward right side. Pain on rotation of head and on extension from its position of lateral flexion. Face flushed and hot. Temperature 102° ; pulse fast and weak, about 120. The space between maxilla and mastoid process swollen, excessively tender, resistent to touch in the direction of internal jugular. Glands anterior to it enlarged and movable. Mastoid region not excessively swollen ; painful on pressure, especially over antrum mastoideum. No special tenderness over mastoid emissary nor at this time cyanosis or unequal prominence of the right side of face noticeable. The external auditory meatus showed no sinking of roof and contained but little serous discharge. A perforation of the membrana tympani could not be made out ; general aspect of drum red, not uniformly, pinkish in spots. Its surface irregular, handle and processus brevis not visible. The upper posterior section had the appearance of a flat smooth granuloma, but capillaries could be seen crossing its surface. The anterior half of the membrana tympani greatly bulging, thickened, and red. The discharge had no particular odor. Valsalva negative.

Functional examination of ear was not made. Patient was at once admitted ; ice-bag ordered to be applied ; eyes to be examined by oculist ; proper local and general preparatory treatment for operation. Temperature on admission, 102°. Pulse, 90, irregular ; face flushed, tongue coated, foul breath ; extremely restless ; pain in head and neck. Obstipation ; objects appear double. At 2 P.M. patient had a severe chill ; temperature 104°, pulse weak and rapid. During the rest of the day temperature varied from 100⅘° to 103°. Pulse, 80. Next day condition about the same ; prepared for operation.

On morning of operation, temperature 102.4°, pulse 70 ; probably due to digitalis. External jugular on right side visibly

distended, left cannot be made out. The swelling in maxillary angle seemed somewhat softer, still painful and of greater area. He had no chill and seemed brighter. The temperature being still 102°, operation proceeded with, the patient being properly prepared. Chloroform narcosis, assisted by Drs. O'Kelley, Feingold, and Prof. Matas, who kindly ligated the internal jugular.

The operative procedure, including the removal of the entire mastoid process, the posterior osseous wall of the external auditory meatus, the freeing of the aditus ad antrum, the removal of the lateral wall of the attic and the ossicles, the cleaning of these regions, ample bone resection, I only need mention in this meeting of experts presented nothing of special interest. The bone was freely bleeding and the mastoid emissary pervious. We uncovered an extensive blackish-looking, highly offensive mass, freely bleeding and pulsating; adjacent to it backward lay the dirty grayish-white fatty degenerated wall of the lateral sinus. The sigmoid sinus was exposed to its upper and the entire lower knee, where it was collapsed with its wall detached from its bony bed. The sinus was opened in the entire length of its exposure and a solid coagulum removed, free in its upper part of macroscopical pus or broken-down material, which were present in the lower half of the clot. This condition and the intense pyæmic infection caused me to consider the ligation of the internal jugular, which was done at my request by Prof. Matas, who witnessed this stage of the operation. He also removed the super-imposed glands, and the end of the resected vessels was anchored in the closed wound after irrigation of the jugular from above and below. The upper occluding thrombus was not dislodged, bleeding freely when touched, appeared not to be infected and to be its upper end. The thickened detached walls of the sigmoid sinus were excised and the interior of the vessel cleaned down to the jugular bulb. The bony edges were smoothened, the wounds dressed, and patient put to bed in good condition. On the fifth day the dressing was changed for the first time. Pulse and temperature had kept within normal limits and the general condition of the patient was entirely satisfactory, excepting the second day, when the pulse was for a short time 56 and the temperature 96.2°. Complete right facial paralysis after the operation in spite of due precaution and trained assistance. After an examination of the fundus of the eyes on second day after the operation, the attending oculist reported greater filling

and tortuosity of the veins of the fundus than normal, more on right than left side. Bilateral abducens paralysis. The removal of the dressing showed upper wound dry, but of peculiar odor, with limited area of blue pus on the surface, and in the depths not entirely free from fœtor. The bed or sigmoid sinus could be followed to jugular foramen, the vessel wall having detached itself still farther below the point of its excision, otherwise the upper wound looked well. The lower dressing freely saturated. The entire region opened for the jugular ligation was in this case also infected and had to be reopened, all ligatures except the one on the lower shrunken and necrotic end of jugular were removed and wound cleansed as far as possible. After this the patient's general and local condition continued satisfactory and he progressed in a normal manner; the facial paralysis remained the same. Upon the eye condition I will submit a report of the oculist. To control the healing of the large area of exposed bone, comprising, besides the field of operation proper, the entire bed of the sigmoid sinus to the jugular foramen, necessitates the retention of a temporary postauricular opening. This has since been closed satisfactorily by a modified Stacke plastic operation.

Remarks.

The question of *ligation of the jugular* is, as we see, still *sub judice*. Other avenues of infection on one hand, and the presumption of an occluding clot in the jugular on the other, seem to argue against the necessity of always tying the jugular, aside from the statistical position of the question. The preponderance of recoveries being in favor of the cases where ligation was made, I personally should favor it where a high degree of pyæmia is evident, securing the patient against an important avenue of infection. When ligation is performed it appears to me that the vein should be resected at once as high up as possible. Had this been done in the first case it is probable that the pus accumulation might have been reached, but I do not believe that even this would have saved the patient, when we consider that on post-mortem pus was apparent in the lumen of the vertebral foramen and the foramen ovale. I am impressed that the affection can spread also from these sources which were not surgically

accessible. Our attempts to find the source for the continuance of the pyæmia ceased at no time so far as the cerebrum and cerebellum were concerned. The depressed sensorium kept our attention fastened to these regions and we made properly directed attempts to find the cause for it in the temporal lobe, and the contiguous part of the cerebellum was also explored to the internal auditory meatus. The poor condition of the patient, the absence of symptoms, from the existing accumulation, which might have indicated their location, or the fact that lack of experience permitted such symptoms to escape our observation, were singly or combinedly the cause that we did not search for them where they existed, though we knew they existed somewhere.

The second case proves that efficient and competent attention is no security against the progress of a life-threatening middle-ear complication. It is entirely probable that the trivial injury to the head set free the lower part of the thrombus and caused the pyæmia which the patient showed when admitted. The complete and immediate subsidence of the fever after removal of the infected clot and occluding the avenue of infection seems to point to it and to the advisability of ligating the jugular at once, as it does not materially augment the danger to the patient.

The very unwelcome accident of producing *facial paralysis* deserves our consideration. All due precautions while operating in the neighborhood of the course of the nerve had been taken, and I could rely upon the close observation of the assistant to whom this duty was given. Yet the accident occurred. Schmiegelow reports that four times this accidental effect of traumatic facial paralysis occurred to him in fifty-three cases of operation for the cure of chronic middle-ear discharge, where the entire middle ear was opened (*Nordiskt med. Arch.*, No. 17, 1898).

I have in no other case, upon which I have made a radical operation, to note this lasting result.

Another important and interesting complication is the *eye affection;* whether it is due to a continuity of the thrombus to the ophthalmic veins or due to a localized meningitis, is

difficult to decide, and authors having the largest experience offer the above theories.

I append a short and general report of the oculist, Dr. Feingold:

Patient sees double since two days previous to his admittance to hospital. Examined two days after operation; paralysis left external rectus and paresis of right external rectus.

In fundus: Slight engorgement of retinal veins. No papillitis after this date. Right external rectus became gradually completely paralyzed. Examination three weeks later; no double vision; paralysis of external recti still persisting. Vis. R E $\frac{5}{12}$ (?), L E $\frac{5}{15}$ (?). Explained by state of fundus; neuritis nervi optici ambilateralis with prominence of about 3 dioptries and exudation around papillæ. Regular examination showed paralysis to improve; double vision again appeared. The papillæ became less prominent, the white patches of exudation on retinæ became smaller until they entirely disappeared. Coincident with this repair in the fundus the external rectus muscles regained their strength and only a slight paresis is yet left. Hopes of retaining a valuable amount of sight proved fallacious. In place of the former patches in the retina appeared in macular regions white shining spots very much like albuminuric retinitis (albumen and sugar absent on repeated examinations), the vessels became thinner than normal, papillæ grayish white. Visus gradually sank until central vision is now practically absent and patient, after correction of hypermetropia, has just enough sight to move about unaided. This does not seem to be the last stage of this process, as under strychnia injections his peripheral vision seems to have improved sufficiently to permit hope for more.

ACUTENESS OF HEARING BEFORE AND AFTER RADICAL OPERATIONS.[1]

By Dr. F. WAGNER, in Basel.

Translated by Dr. Carl Mund, New York.

In determining the influence of those diseases of the ear which can be cured only by a radical operation on the function of the auditory organ, "the hearing," we may consider the following questions:

I. What hearing-power remains after the operation?

II. In what way are the indications for performing an operation influenced by the state of hearing?

In connection with these questions we could also ask, what hearing-power will remain when the drum-membrane, hammer, and anvil are eliminated from the system of sound-conduction? This determination can only be very conditional, for the question is not that of a simple exclusion of the drum-membrane, hammer, and anvil, inasmuch as, on the one hand, after the healing there takes place a fixation of the limbs of the stapes or its remains in the cicatrix, as well as a change in the closure of the round window; and, on the other hand, in some cases a greater or less participation of the labyrinth in the progress of the disease indicating the operation may be present.

In 22, including two deaf-mutes, of the 53 — 4 of these bilateral — cases operated on radically by Dr. Schwendt, the hearing was tested, after the operation, in 13, operated

[1] From the Oto-Laryngological Clinique of Dr. A. Schwendt, Lecturer at the University in Basel.

on one side only,—in 2, operated on both sides, after the operation ; and in 7, operated on one side, before and after the operation.

The testing of the hearing consisted of:

1. Ascertaining the lower-tone limit; for this the continuous series of Appunn's tuning-forks of 20–21 v. d. were employed.

2. Ascertaining the upper limit by means of Edelmann's Galton whistle (normal upper limit) at division-line 0. 6.

3. Ascertaining the hearing-duration *by air-conduction* for a number of tuning-forks.

4. Ascertaining the hearing of speech in the cases operated on both sides.

5. Ascertaining the hearing-duration by bone-conduction and the ratio of the hearing-duration between air- and bone-conduction.

The tuning-forks and their values for the normal ear, which were applied to Nos. 3 and 5, were:

		Tuning-forks of Hartmann-Lucae, clamped.			
		A	A	c	c¹
Duration of hearing,	*a*) Air-conduction	90	50	50	90
	b) Bone-conduction (over mastoid)	28	12	14	21
Relation of air- to bone-conduction, (Rinné)		+50	+32	+18	+42

		Unclamped Tuning-forks of Hartmann-Lucae. of König.			
		C_2	C_3	C_4	C_5
Hearing-duration,	*a*) Air-conduction	70	68	32	12
	b) Bone-conduction (over mastoid)	—	—	—	—

The method in testing the hearing is the well-known one. To ascertain the hearing-duration — after Bezold,— the difference between the pathological and the normal hearing-duration was ascertained by experiment, and the hearing-duration, diminished pathologically, was calculated in percentages of the normal.

In order to control, sometimes the test was worked out in such a way that the hearing-duration of the pathological ear was found directly by the average value from several

trials, which then is to be calculated, in the manner given above, in percentages of the known normal hearing-duration. This method seems to yield more accurate results, inasmuch as by it we eliminate our own disposition to hearing, which differs on different days. Notwithstanding this, the results according to the former methods were decisive, being obtained by the method in general use.

The second method, however, always was applied in ascertaining the hearing-duration by bone-conduction. This hearing-duration was found by several trials directly by instantaneously applying the tuning-fork A, c and c^1, at times also c^2, to the mastoid of the ear operated upon, and the average value computed from this — always with the exemption of all values differing too greatly and therefore being improbable — was simply compared with the known normal value.

I.—What hearing-power does there remain after the operation?

In order to answer this question, from the states of hearing mentioned above, the following results can be grouped:

1. *Low Limit.*

The low limit (for 24 auditory organs operated upon) was:

Once at 39–40 v. d. (dis_1) (case No. 1 with exceptionally favorable hearing-power);
3 times at the upper end of the contra-octave;
16 times in the large octave (of this 10 times between E and G);
3 times in the small octave;
once at the beginning (d^1) of the once marked octave.

Apart from an exceptionally favorable case and three bad cases, which later will be discussed, the field of hearing begins in the large octave, viz., mostly in its middle, between E and G

2. *High Limit.*

In 20 of the 24 auditory organs examined the high limit was between division 1. 2 and 0. 6 of Edelmann's Galton whistle.

In three auditory organs the high limit was lowered, a fact which, according to general opinion, should indicate a complication of the labyrinth; these cases were as follows:

No. 2;	high	limit	at division	3.2
No. 11;	"	"	"	3.4
No. 13;	"	"between	"	3.9 and 4.8 varying (with different tests).

Case 1 (No. 12) remains dubious, relative to the high limit. Although in case No. 2 there were no further symptoms implying a complication of the labyrinth, such, however, were shown to exist in Cases 11, 12, and 13.

After the radical operation, in general the high limit remains normal or almost normal in uncomplicated cases.

3. *Hearing-duration.*

The values of hearing-duration expressed in percentages of the normal can be observed directly in a long and complicated table, which we cannot reproduce in the translation. It is to be mentioned that for c^5 the value of hearing-duration can be fixed less accurately than the other values; with the short hearing-duration for the normal ear — 12 seconds — a faulty observation of only 1 second in the percentage is greatly perceptible.

Beginning at the lower limit of hearing in most of the cases, there takes place a gradual and uniform rising of the values of the hearing-duration towards the higher octaves. In some cases these values for the lower octaves remain tolerably even, and rise only beginning from the 2d or 3d octave. This condition is very much pronounced in cases Nos. 4 and 19: the values of hearing-duration remain the same, and that on pretty low scale, and all at once they rise, beginning at the 4th octave; in Case 19 this condition is the same before and after the operation.

Of all values of hearing-duration, probably the most important one is that of c^2, of that tuning-fork sound, which is found within the part of sound-scale (according to Bezold from b–g_2) most necessary for *voice*-hearing. Apart from case No. 1, mentioned before, the value of *hearing*-duration

for c^3 remains 50 % below the normal hearing-duration in all the remaining cases.

The average value of the hearing-power in 21 cases (Cases 11, 12, and 13 were not included for reasons to be given later) is 33 %, viz., $\frac{1}{3}$ of the normal hearing, a fact which does not by any means correspond to a uniform fraction of the hearing-activity.

4. *Voice.*

To what extent now does this 33 % suffice for hearing speech?

To test for perception of speech the cases operated upon monolaterally would lead to no perfectly unobjectionable result. The hearing-power of the operated ear will in all cases only constitute a fraction of the other one not operated on, whether the hearing-power of the latter be normal or reduced; the ear operated on, possessing only a fraction of the hearing-power of the other ear, will, therefore, never be much utilized.

Even if by closing the ear not operated on one can exclude it from the hearing-test, the result of the voice-test will not be adequate to the actual hearing-power of the ear operated on, for the reason mentioned above. However, if it is impossible to exclude from the testing the ear not operated on — and this almost invariably will be the case if it possesses normal hearing-power — then a monolateral test is by no means practicable.

True and unobjectionable results are produced only by testing cases operated on bilaterally, for in such cases the one ear can readily be excluded, and an ear tested which is accustomed daily to hear the voice.

Of the two cases operated on bilaterally, case No. 14 has a hearing-duration of 25–28 % for c^3, thus a little below the average value computed before; No. 15, a hearing-duration of 28–31 %, thus almost equal to this average value.

Speech-test in case No. 14, B. Jacob; operated on when 7 years of age; now 12 years old.

Whispered numbers:

The numbers with high consonants: (6, 7, etc., alone and in combinations) } heard at 10–20 *cm.*

The remaining numbers only near the ear:

The numbers 9, 100, etc..... { R, not at all. / L, at ear with difficulty.

Whispered words (according to Wolf):

Words of the high or middle group (Säge, Feder, Tante, Kette, etc.): } heard at 10–20 *cm.*

Words of the low group (Ruhe, Bruder, Reiter, etc.): } not heard, or only in fragments.

Lingual *r*, not, on either side.

Toneless sharp *s*, at 10–20 *cm* well.

Ordinary speech well heard.

The boy is attending school with success. His own voice is loud, but not shrieking.

Speech-test in Case 15; operated on when thirteen years of age; now eighteen years old. (R without stirrup, which during the operation was removed, together with the hammer, to the head of which it was adherent by its foot-plate.) Whisper voice heard much better on the right side, the one without the stirrup, than on the left. Whispered voice:

of the high group (7, 6, etc.) { R, 3–6 *m.* / L, at ear — 10 *cm.*

of the low group (100, 9, etc.) { not at all, / or at ear.

These values, however, fluctuate considerably; those just named were obtained by an examination in November; another examination in July gave as a result of the

hearing-distance R { 7–8 *m* for numbers of the high group / ½–1 *m* " " low "

hearing-distance L { 10 *cm* — at most ½ *m* for numbers of high group / 10 *cm*, for numbers of low group

Although the values of hearing-duration do not differ much, yet the hearing for speech is far better R than L. Hearing-duration and hearing-acuity of speech consequently do not decrease in the same proportion. Conversation is well understood; from time to time hearing is made worse by cerumen, after the removal of which hearing is the same

as before. His own conversation is held in the usual conversation tone.

The hearing-power after radical operation is perfectly sufficient for hearing the language already acquired; so far it is impossible to give an opinion as to whether it also would be sufficient for acquiring a language.

5. Results of Testing Bone-Conduction. (Weber-Schwabach-Rinné's test.)

These tests, on frequent repetitions, did not always give perfectly uniform results; nevertheless, from the figures obtained, relatively the average values, it is possible to form a general picture of the character of the test.

The tuning-forks A, c, and c' placed on vertex (Weber's test) in the cases operated upon monolaterally:

11 times were lateralized to the ear operated on;
6 times the test was doubtful;
3 times the tuning-forks were lateralized to the ear not operated on.

In the cases operated on bilaterally, the test in one case remained doubtful (Case 14), in one case R > L heard (Case 15, R side without the stirrup).

With regard to the hearing-power by bone-conduction (from the mastoid process of the ear operated on) and its relation to the hearing-duration with the normal ear (Schwabach's test), the following is to be noticed.

To be excluded are cases Nos. 11, 12, and 13, in which the tuning-fork, placed on the vertex, was lateralized to the side not operated on, as in these cases it is not certain whether the value of hearing-duration of the tuning-fork placed on the mastoid process of the ear operated on really refers to this ear.

In the remaining 19 cases the hearing-duration in relation to the normal was:

in 7 cases decidedly prolonged;
in 11 cases not prolonged; and
in 1 case (No. 4) it remained the same for the tuning-forks A and c; for c' the hearing-duration was shortened.

The determination of the relation of air-conduction to

bone-conduction (Rinné's test) for the tuning-forks A, c, and c^1 gave as a result a preponderance of hearing-duration by bone-conduction over that of air-conduction (Rinné negative). Exceptions to this were:

The repeatedly mentioned case No. 1, in which Rinné's test resulted — for A, but shortened + for c and c^1, a further evidence of the exceptionally favorable conditions of this case.

In case No. 16, Rinné's test was — for A and c, shortened + for c^1. There also is to be mentioned that in Cases 19 and 21 Rinné's test for tuning-fork c^1, which before the operation was ± 0, relatively shortened +, turned out to be — in both cases after the operation.

This perception of low tones chiefly by bone-conduction in general indicates an impediment in sound-conduction, which by air-conduction only can be overcome by the sounds of the higher octaves.

In considering, on the other hand, Cases 11, 12, and 13, which were several times mentioned before, the following must be called to notice:

Nos. 11 and 13 have a decidedly reduced high limit; in No. 12 this was doubtful.

In all three cases there is a lateralization of the tuning-forks placed on the vertex, to the side not operated on.

In Case 11, the hearing-duration for A, c, and c_1 by bone-conduction, in proportion to the normal, is decidedly shortened both when the tuning-forks are placed on the mastoid process of the ear tested, or of the other ear; in Cases 12 and 13, the values of hearing-duration by bone-conduction are about equal to the normal, but according to the result of Weber's test they may as well be referred to the ear not operated on.

In connection with this it should be mentioned that in these three cases, as compared with the others, the low limit lies very high, and that the values of hearing-duration are trifling.

Case No. 2, which also has a reduced high limit, does in other respects not differ from the other cases.

The conditions in Cases 11, 12, and 13, which showed a

reduction of perception for all sounds, as well for low (reduction of bone-conduction), for the intermediate, and high (reduction of hearing by air-conduction), as also for the highest (reduction of the higher limit), cannot be accounted for completely by impediments of sound-conduction present, but only by a complication situated in the labyrinth.

If these three cases excite the suspicion of having labyrinth complications, the latter undoubtedly is present in Sch. Otto, the deaf-mute mentioned before. He has a complete deficiency in his field of hearing on the right side, occupying the upper half of the 4th octave, while on the better-hearing left ear, in the very same region there takes place a depression, the very loud sounds being heard only near the ear and incomparably worse than the remaining sounds. This condition indicates that bilaterally the same spots in the labyrinth, possibly in unequal intensity, must be affected. In reviewing the results of our hearing-tests, we obtain, after the radical operation, a field of hearing corresponding to the amount of hearing which in uncomplicated cases begins at the large octave increases from octave to octave, and approaches the normal or almost normal limit.

If of the uncomplicated cases we compute for each sound an average value from the obtained percentage values of hearing-duration, we obtain the following field of hearing, which probably could be modified by a greater number of observations:

Lower Limit	Hearing-duration in % of the normal							High Limit
	A	c	c^1	c^2	c^3	c^4	c^5	Normal or Almost Normal.
In the Large Octave.	13,	17,	22,	33,	40,	60,	70	

The hearing-duration by air-conduction is reduced for all tuning-fork sounds, for the lower ones (up to c^1), it is less than the hearing-duration by bone-conduction, even if the latter were not increased in proportion to the normal.

II.—In what way are the indications for performing an operation affected by the state of hearing?

Here again we can differentiate.

1. In what way is the hearing-power existing before the operation affected by the operation itself? and

2. In what way are the indications for performing the operation affected by the result of a hearing-test?

The first question is partly answered by the already obtained proof of the existence of a certain hearing-power after the operation. If we then compare the conditions of hearing, which were taken before and after the operation in the same case, we find them to be almost even in cases Nos. 16, 17, 18, and 19. (The differences probably could be accounted for by erroneous observations. In connection with this let us once more point to the same peculiar condition before and after the operation in case No. 19.)

No. 20 shows a slight improvement, Nos. 21 and 22 a slight change for the worse. Patient No. 21 claimed to hear a little worse than before the operation. Although the percentage values of hearing-duration did not differ very much, at least not more than is allowed for errors of observations, this claim nevertheless appears right and is accounted for by the fact that Rinné's test, which before the operation was a very much diminished +, became — after the operation, without an increase of the bone-conduction having taken place, due to a greater diminution by air-conduction. In Case 22 the change, also only slight, shows itself in the entire field of hearing. With this patient it is to be noticed that the healing was greatly retarded by granulations, which formed on the floor and at the adjacent part of the median wall of the tympanic cavity. It is quite possible that this resulted in a closure of both windows by means of a dense cicatricial tissue. This similar or, at least in general, only slightly changed condition of hearing-power before and after the operation proves that the impediments to sound-conduction must be the same, or if this were not the case, at least the same in regard to their effect.

In all of the seven cases mentioned the system of sound-

conduction was deficient. The conditions (partly otoscopic, partly found at the operation) were the following:

CASE.	DRUM-MEMBRANE.	HAMMER.	ANVIL.	STIRRUP.
16	Destroyed.	Destroyed.	Present.	Visible, easily movable.
17	"	"	"	" "
18	Large perforation.	"	Carious.	Not visible.
19	Destroyed.	Present.	Present.	" "
20	"	Destroyed.	Destroyed.	" "
21	"	"	Present.	Visible, movable.
22	Perforation of membr. Shrapnelli.	"	Destroyed.	" "

The remainder of the ossicles always were removed at the operation. It is readily understood that in cases in which there is a loss of continuity between stirrup and the peripheral parts of the chain of sound-conduction (18 and 22), the latter do not come in consideration for sound-conduction. If the anvil is still present, it is very doubtful whether it is in connection with the stirrup, even if macroscopically a caries of the process is not noticeable. The fact that at the operation the anvil is readily extracted proves that the connection is certainly only a very loose one. The functional examination shows that these remnants are of no account for sound-conduction. In three cases in which the anvil was present, the hearing-power remained the same, also in one case in which anvil and stirrup were separated; and in one case in which the anvil was present, there was a slight change for the worse.

This appears to prove that the hearing-power is not affected by the rest of the drum-membrane and ossicles which were still present before the operation.

The changes in the hearing-power, which always are but trifling, we may attribute to the condition after the operation: greater or lesser motility of the stirrup, enveloped in cicatricial tissue, more or less dense, tissue formation in the niche of the round window. Consequently in such cases in which the disease in the ear has progressed to such an extent that **all the symptoms indicate the necessity of an operation, the hearing-power is reduced to such a fraction that**

(complications excepted) it will not, or only to a very small degree, be affected by the operation.

Therewith we come to the second part of the question, in what way a given condition of hearing could influence the indication for performing the operation.

If the condition of hearing obtained by examination is within the limits given above, taking it for granted that the hearing is not essentially changed by the operation itself, and that a certain portion of acuteness of hearing is irrecoverably lost by disease of the ossicles and the walls of the tympanic cavity, it might be the determining factor in advising an operation.

On the other hand, in case the state of hearing be relatively better than the average value (or rather than in the most favorable case of our series), we are justified in taking it for granted that the system of sound-conduction is pathologically, not at all, or only very little at fault, and that an expectant and non-operative treatment could still further improve the function. Of course it has to be admitted that in such a case even the other symptoms would not be urgent for an immediate operation, so that this consideration is more of a theoretical nature. Nevertheless, there are cases in which there is a doubt in regard to performing an operation, and where the state of hearing would possibly point out the proper way. It is, however, not intended to deny that this state of hearing may be obtained by a simpler method of testing. But Dr. Schwendt never operates without having sufficiently completed the picture of symptoms by hearing-tests.

In the series of the other indications for the performing of an operation, the state of hearing always occupies only the second place; in doubtful cases, however, it may designate expectant treatment to be desirable or futile.

I am indebted to Dr. A. Schwendt for suggesting the subject of this paper, and furnishing me with all the material required for its preparation.

ON DISEASES OF THE ORGAN OF HEARING IN PERNICIOUS ANÆMIA.

By Dr. SCHWABACH, Berlin.

Abridged Translation by Dr. Julius Wolff, New York.

IN his paper on "Hemorrhages into the Labyrinth Following Pernicious Anæmia," read before the Otological section of the Tenth International Medical Congress at Berlin, Haberman drew attention to the striking fact that no cases of hemorrhage into the ear in pernicious anæmia had as yet been reported, although bleeding into other organs, especially the retina, was frequently observed. He sees the explanation for this in the rarity as well as in the rapid and usually fatal course of pernicious anæmia, which prevents the attention being drawn to the ear symptoms.

In my search of the literature on this subject, I could find no other reference to it except a brief mention by Brieger of a case of hemorrhage into the tympanic cavity accompanying pernicious anæmia, in which the extravasation of blood was followed by suppuration after plugging of the nostrils. It does not, therefore, seem to me out of place to report a case of this kind which I had the opportunity to observe in one of the hospitals of Berlin and in which I was able to make a microscopic examination of the organ of hearing. At the same time I will report several other cases which during the past few years were referred to me for otological examination by the directors of the medical department of this hospital, Dr. A. Fraenkel and Dr. Stadelmann.

There were seven cases in all; the *first* of which was a woman,

forty-eight years of age, who came to the hospital on Nov. 14, 1894, with pronounced subjective and organic evidences of pernicious anæmia. On Nov. 23d, numerous fresh hemorrhages were found in the fundus oculi, and on the same day the patient complained of deafness in the left ear. Tinnitus had been noticed for eight days past. Examination revealed slight injection of the drum-head and a small ecchymosis upon it. The functional tests resulted as follows: Watch not heard either by air- or bone-conduction, loud voice close to the ear; low tuning-forks not heard, higher ones shortened. Weber to left; Rinné negative. Right ear normal. The next few days, improvement of general condition without change in ear symptoms. Dec. 5th, pain in left ear, tenderness over tragus and mastoid process; purulent discharge from middle ear. These symptoms disappeared under treatment, but hearing did not improve. In January severe general symptoms developed and patient died Feb. 8, 1895.

Examination of the blood at the end of January showed a decrease of hemoglobin to 25%; red blood cells 650,000 on the day before death; no increase in the number of white corpuscles. Marked poikilocytosis; some nucleated red blood cells. The findings at the autopsy were: general anæmia, fatty heart, myocarditis, swelling of the spleen, parenchymatous nephritis, old scars in the stomach, and swelling of the lymphatic glands. The anatomical examination of the ear could not be made.

Case 2 was a woman, fifty-six years of age, admitted Oct. 28, 1895. In March she first began to complain of ill-health and at the time of her admission presented numerous symptoms from which the following diagnosis was made: Essential pernicious anæmia, insufficiency and stenosis of mitral valve. Percentage of hemoglobin was 20–25, number of red blood cells only 500,000; marked poikilocytosis. On Nov. 12th, patient complained of noises and deafness which had appeared suddenly the day before in both ears. On the following day, pains in both eyes, especially the left. Ophthalmoscopic examination revealed numerous retinal blood spots. Vision normal.

Examination of the ears: *A. D.*: Watch heard on contact, not heard by bone-conduction; whispered voice at 1 *m*. Low forks not heard, c^{IV} shortened 15 sec.; c on right mastoid prolonged 2 sec. Rinné negative. *A. S.*: Watch not heard at all; whispered voice, close to ear. Forks not heard through air at all; through

mastoid c shortened 4 sec. Weber to right. Membrane on both sides appears dull; no reflex.

As the patient's general condition improved somewhat, she left the hospital on December 20th, at her own request. Number of red corpuscles had increased to 1,716,000, and the hearing on the right ear was slightly better, whisper at 1.5 *m*. On January 30, 1896, she was readmitted in a moribund condition. Death followed on the very next day.

It was not possible to examine the ears again before the patient died. On January 31st an autopsy was performed. All the organs were found to be extremely pale and showed slight icterus; otherwise they presented no marked pathological conditions. For purposes of microscopic examination the petrous portion of the right temporal bone was hardened in Müller's fluid, decalcified in 10 % nitric acid, rehardened in alcohol, embedded in celloidin, and cut in series perpendicularly to the long axis of the bone. Staining of the sections in hæmatoxylin and eosin. A number of specimens were stained according to Weigert in order to examine the auditory nerve. The results were as follows: In the mucous membrane of the Eustachian tube, particularly of its bony portion, was a moderate infiltration with small cells which increased in density in the direction towards the tympanic opening; vessels rather well filled, the epithelium everywhere well preserved. The mucous membrane of the tympanum presents in its anterior portion a fairly dense small-celled infiltration; it is slightly thickened, and is studded here and there with small hemorrhages. In the posterior portion the hemorrhages into the mucous membrane are more numerous, while the floor of the tympanic cavity is occupied by a considerable quantity of free, extravasated blood, as is also the niche of the oval window. Medially this extravasation goes over gradually into a rather thick layer of fibrin which, in turn, borders on some newly formed, vascular connective tissue. The latter extends over the mucous membrane of the base of the stapes and of the adjacent parts of the niche and promontory, the mucous membrane at these points being bared of its epithelium. At several other points of the tympanum a similar condition exists, and here and there a fibrino-purulent exudation covers the mucous membrane. Extravasations of blood are also present in the attic, and in the region of the posterior Tröltsch's pocket. Here also, as well as around the malleus and incus, the mucous membrane is thickened, infiltrated with small cells, and filled with

distended vessels; the same condition prevails in the cells of the mastoid, where extravasations of blood are also to be seen. In addition to a small perforation in its anterior inferior quadrant, the tympanic membrane presents a subepidermal hemorrhagic vesicle, 5 *mm* long and 2 *mm* thick, whose bloody contents seem to be interspersed here and there with leucocytes. The cuticular layer of the membrane is very much thickened and contains numerous over-distended blood-vessels.

Nowhere in the cochlea, vestibule, semicircular canals, and auditory nerve or its branches can the slightest trace of a hemorrhage or small-celled infiltration be recognized; nor does Weigert's stain reveal any pathological conditions in the nerve.

Case 3 was a woman, thirty-one years of age, who was admitted on January 20, 1897, and died as early as February 17th. She presented no objectively discoverable changes in her ears and no impairment of hearing. She complained of subjective noises in both ears, which had appeared, together with the onset of general symptoms, four years before. There were no hemorrhages in the fundus of the eye, but the skin of the extremities was studded with them. An autopsy was not allowed.

Case 4 was a man, fifty-five years of age, of whose subjective symptoms nothing is known. An examination which I made only a few days before his death revealed nothing more than peripheral dulness of the membrane. On account of the delirium, which lasted till death, the hearing could not be tested. Hemorrhages in the retina of each eye.

In Case 5 also (shoemaker, fifty-two years of age) no data concerning the subjective symptoms relating to the ears were at hand. When I saw the patient he was in a somnolent condition, and no objective changes were discoverable. Hemorrhages in the eyes. Death ensued after a few days.

Case 6 was a workman, nineteen years of age, who, though he complained of dizziness and slight tinnitus, had normal hearing. Objective examinations revealed normal conditions in both ears. In this case also there were hemorrhages in the fundus of each eye. Death after eight weeks. In two of the last three cases, an autopsy was made, but the temporal bones could not be obtained for an anatomical examination.

Case 7 (painter, fifty-seven years of age) remained in the

hospital only two weeks, when his improved condition allowed him to leave it. Examination of the blood had revealed the characteristics of pernicious anæmia. Following a fall on his head while still a child, the hearing of the right ear had been lost; the left ear remained healthy until recently, when he noticed pulsating noises on that side. Hearing *A. D.*: the watch and voice cannot be heard at all, neither by air- nor bone-conduction. Fork c not heard through the air; on mastoid it can be heard, but shortened by 5 sec. *A. S.*: watch heard on contact only, but not through bone; whisper in 2–3 *m.* Hearing of fork c shortened by 17 sec. through air, by 3 sec. through mastoid. Rinné negative on left side. Weber lateralized to left. Otoscopic examination showed dulness of right *Mt* and retracted scar in posterior superior quadrant; on left side, dulness of *Mt* and foreshortening of hammer. Hemorrhages in the eyes present in this case also.

A **review of the ear symptoms** of these seven cases shows that in five of them subjective noises were present; by three of these patients the noises were heard in both ears and by two in one ear only. The two remaining cases could give no information on this point on account of their condition (delirium, somnolence).

Deafness was complained of by three of the five patients by whom subjective noises were heard, but in one of them only one ear was affected, and in another the deafness of one ear was due to an old traumatism, so that this ear must be left out of account. There remain, therefore, four ears in three of which the hearing was markedly impaired (voice close to ear), while the fourth could distinguish whispered words at 2–3 *m.* Accurate tests with tuning-forks could be made in only two of the above patients (Nos. 1 and 2), comprising three affected organs of hearing, and in another (No. 7) air- and bone-conduction were tested with fork c only. The results of the examination of the first three ears were as follows: Low forks (16, 32, 48 vibr.) were not perceived in any case; c (128 vibr.) and c^{IV} (2048 vibr.) also were not heard by one of the ears, while the period of perception of the two remaining ears was shortened for these forks. In two of the ears perception of c through mastoid was lengthened

by 7 and 2 sec. respectively, in the other shortened by 4 sec. Rinné was negative in two ears, and in the third was of no value as a test since c could not be heard at all through air. These results of the hearing-tests allow us to come to the conclusion that *in Cases 1 and 2 (Rt.) we have to deal with an affection of the sound-conducting apparatus.* In Case 7, however, the examination was too incomplete to permit the forming of even a probable diagnosis. Objective examination with the reflector showed a condition worthy of note in the first case only. It consisted in a small ecchymosis in the membrane and diffuse injection of the latter, followed later by suppurative otitis media with perforation of the membrane and a pulsating light reflex.

Whether our localization of the cause of the deafness in the two accurately tested cases, namely, in the sound-conducting apparatus for Case 1, and in the sound-perceiving apparatus for the *left* ear of Case 2, is correct or not, must remain undecided, since anatomical proof could not be obtained. But as for the *right* ear of Case 2, the correctness of the conclusion arrived at by means of the tuning-fork tests, which led to the diagnosis of an affection of the sound-conducting apparatus, was fully substantiated by the anatomical examination. The latter showed that while the sound-perceiving apparatus was entirely normal, the middle ear presented in various regions anatomical changes in the shape, principally, of extravasations of blood. These, especially by their encumbrance of the oval window, are ample, according to the present generally accepted views, to account for the symptoms that were observed during life, namely deafness, subjective noises, negative Rinné, etc. That the deafness and subjective noises were due to the hemorrhages around the oval window is made even more probable by the suddenness with which these symptoms appeared. The absence of vertigo throughout the patient's sojourn in the hospital is also in harmony with the anatomical findings, inasmuch as the labyrinth was entirely uninvolved. Still we are not justified in drawing hard and fast conclusions from this fact, since we know nothing of the pathological condition of the *left* ear, although the functional tests pointed

strongly to an affection of the sound-perceiving apparatus on that side.

It is a source of much regret that the left ear could not be subjected to a microscopic examination as well as the right, for if in this ear also the vestibule and semicircular canals had been found to be normal, this would have been a strong support to the theory which supposes these parts to be organs for maintaining the equilibrium, because even with such severe anæmia of the brain, symptoms of vertigo were not present. In Habermann's case, where extensive hemorrhages were found in the vestibule and semicircular canals, marked vertigo was indeed present.

The fact that nothing more than merely slight dulness of the membrane could be seen on otoscopic examination during the patient's first sojourn at the hospital is readily accounted for by the hidden location of the hemorrhage in the niche of the oval window, which was accountable for all of the symptoms. The hemorrhagic vesicle, which was found post-mortem in the drum-membrane, must be ascribed to a renewed hemorrhage into the ear prior to the patient's second admission. This assumption is borne out by other microscopic findings. There was a fresh hemorrhage in the niche of the oval window, which, however, was superimposed upon a thick layer of fibrin that bordered on some newly formed connective tissue covering the mucous membrane of the base of the stapes. The rather dense infiltration of the tympanic mucous membrane and the distension of the blood-vessels are evidences of an inflammatory process following, probably, an infection from the naso-pharynx, and resulting in the destruction of the epithelium of the mucous lining and organization of the extravasated material.

In concluding, I desire to draw attention to a certain analogy that exists between the few published cases of disease of the ear in pernicious anæmia and the conditions found in leucæmia. In each disease we may observe, either with the onset of or following the general symptoms, sudden or rapidly developing deafness, more or less pronounced in degree, together with subjective noises and not infrequently also vertigo, these symptoms being due to hemorrhages in

different parts of the ear. In a former article on the lesions of the ear in leucæmia I have shown how any part of the organ of hearing, from the external meatus to the auditory nerve, may be the seat of hemorrhages. By the two existing anatomical examinations of organs of hearing affected in pernicious anæmia, namely, the one of Habermann and the one of the author, it is also shown that both the sound-perceiving and the sound-conducting apparatus may be the seat of the anatomical changes.

A NEW CASE OF MASTOIDITIS IN A DIABETIC PATIENT.[1]

By Dr. MUCK, Assistant.

Translated by Dr. Nolte, New York.

F. W., aged forty-seven, an official of Rostock, had biliary colic six years ago, and had diabetes for two years. He complains greatly of thirst and has a ravenous appetite. It appears that he never restricted himself to a strict diet. He is accustomed to quench his thirst with great quantities of beer, and at times he would drink considerable whiskey in addition.

Beginning of March, 1899, he contracted a severe cold and at the same time had gastric catarrh, with profuse diarrhœa and icterus.

On the 7th of March he had intense pain in the right ear, and with it severe epistaxis, which he had had on previous occasions. The following day he had a hammering in his right ear, severe headache, and became hard of hearing.

The apparently strong man visited the aural clinic on March 8th. The examination revealed slight pain upon pressure over the right mastoid region, swollen glands over the sterno-cleido-mastoid muscle, and highly reddened and greatly bulging membrana tympani. Whisper could only be heard close to the ear. On paracentesis a considerable quantity of blood-stained secretion escaped. Strips of gauze were put into external auditory canal and a permanent moist dressing applied.

Shortly after the paracentesis the patient vomited and collapsed. After fifteen minutes he apparently had a highly marked icterus which did not exist before the paracentesis. Evening temp. 39°. Pulse 90. Two per cent. sugar in urine. No chloride of iron reaction.

[1] From the Rostock Ear and Throat Clinic.

March 9th.—New dressing. The gauze in the meatus was saturated with bloody serum. Temp. 38°.

March 11th.—Dressing changed. Gauze in canal moderately stained with yellowish-red secretion. Pulse 80. Temperature normal. Great thirst and appetite. Icterus still present. Lower border of liver normal. Bowels regular. Membrana tympani thickened and grayish-red.

March 13th.—Slight amount of secretion of a highly orange-yellow color in the meatus. Icterus still present. The membrana tympani at the site of the paracentesis is covered with millet-sized granulations, which are taken off.

March 14th.—Pain in the ear more intense. Dried secretion of an orange-yellow color on the gauze in the meatus. No pain upon pressure on the tragus. Severe epistaxis during the night. Icterus more marked. No fever. Whisper heard at 25 *cm.*

March 15th.—Pain increasing in the ear. Auditory canal considerably narrowed. Pain upon touching the tragus and upon mastication.

March 20th.—Inflammation in the external auditory meatus subsided. No more secretion in the canal. Membrana tympani of a grayish-red color and outlines of malleus not visible. Whisper 1.5 *m.* No more icterus.

March 24th.—Inflammation with considerable pain set in anew in the auditory canal and lasted until April 18th.

April 4th.—A part of the reddened membrana tympani again visible, with a pulsating reflex behind. There is now a little brownish secretion which has a slimy consistency.

On the 19th of April the general health of the patient became worse. The facial expression changed. Small pulse, no fever. Complains occasionally of neuralgic pain radiating from the ear towards the top of the head. Antrum pit and anterior border of the mastoid process painful upon pressure, but without any periosteal swelling. Flat glands are noticed below the pit. The percussion notes of both mastoid processes are alike. There is sagging on the posterior meatal wall; on the anterior wall a slight infiltration, painful upon mastication. Yellowish-brown pus in the meatus and in the depth a pulsating reflex.

April 20th.—**Operation:** Straight vertical incision, touching the insertion of the muscle. The bone was yellowish-red. The cortex, compact, very hard, almost 1 *cm* in thickness, showed blood spots in the antrum pit. Immediately underneath were

several empty air cells lined with a congested mucous membrane. Suddenly pus and blood welled forth from behind, without any pulsation, from a fistula filled with granulations, which led down to the antrum through hyperæmic softened bone. The latter was occupied by purple granulations, and was greatly enlarged downward by bone necrosis. The antrum was fully exposed and thoroughly cleaned.

April 21st.—Patient felt very well and showed a very striking improvement in his general appearance.

April 26th.—Dressing changed; meatus dry.

May 31st.—The cavity nicely diminished. At the last dressings the appearance of the granulations was surprising. They were broad and flat, instead of light-red and knob-shaped, so that the cavity appears spread evenly with dark, reddish-brown, soft granulations which bled readily and appeared almost to run into one another. The wound secretion was dark brown.

June 16th.—After an interval of almost eight weeks, the wound was perfectly healed, with a deep indrawn scar entirely covered with skin. The ext. aud. meatus still narrow. The visible portion of the membrana tympani seemed to be thickened and lustreless. No secretion. Most of the whispered words are understood at 6 *m.*

REMARKS.

This case of mastoiditis in a diabetic patient is the fourth one which Prof. Körner has observed. (Compare *Arch. f. Ohrenheilk.*, Bd. xxix., S. 61, *Zeitschr. f. Ohrenheilk.*, Bd. xxiii., S. 234, und Bd. xxviii, S. 285.)

As Eulenstein will publish an extensive paper on the diseases of the ear and temporal bone in diabetics, we only wish to point out the peculiarities of this case.

The disease here occurred in a mastoid process with a thick and compact corticalis and a scanty, spongy, and pneumatic interior. Contrary to Körner's other cases, the mastoid processes of which were filled with pneumatic cells, the necrosis of this mastoid had not been so far advanced. The thick, compact, but not softened corticalis explains also the absence of the dampening of the percussion note over the bone. During the presence of the icterus the color of the secretion was noticed at first to be yellowish, later orange.

An examination by Prof. Kobert showed that the color of the secretion was not due to gall pigment, for the examination for the latter was negative; but that it apparently was due to decomposition of the gall pigment, brought about by the bacteria. The brownish color of the pus noticed when the icterus had passed away was caused by the admixture of the blood derived from the soft and rather freely bleeding granulations.

UPON THE COLOR OF LIVING RHACHITIC BONE AS FOUND DURING MASTOID OPERATIONS IN RHACHITIC CHILDREN.[1]

By Dr. MUCK, First Assistant.

Translated by Dr. H. Nolte.

AT major operations, the aurist has presumably greater opportunity than the general surgeon to see the interior of a rhachitic bone, for he frequently meets with cases of purulent inflammation of the pneumatic cavities of a mastoid process and of purulent disintegration of the surrounding bone in rhachitic patients.

The macroscopic condition of a rhachitic mastoid during life differs from that on the post-mortem table, where the bone, by decreased blood supply, and perhaps also by other post-mortem changes, has lost the bright rose color which it has during life. Only its softness, offering no resistance to the knife, is alike both in living and dead bones.

The light rose color is not due to the hyperæmia of underlying structure shining through the chalkless bone, for it is the same at the thin squamous portion of the temporal bone as it is at the compact (not yet pneumatized) parts. It is solely brought about by the increase of the vascular and medullary formations.

It is remarkable that this hyperæmic bone does not bleed upon chiselling, as we are accustomed to see it in infectious inflammations of the bone.

To illustrate this statement the publication of the following cases appears justifiable, as nothing is said on

[1] From the Ear and Throat Clinic at the Rostock University.

rhachitis of the temporal bone in the works on pathological anatomy of the ear and temporal bone (Schwartze in Klebs's *Handbuch der pathologischen Anatomie*, Steinbrügge in Orth's *Lehrbuch der speciellen pathologischen Anatomie*, and Habermann in Schwartze's *Handbuch der Ohrenheilkunde*), nor is there anything in the articles devoted to the relations between aural and general diseases (Moos in Schwartze's *Handbuch*, Haug, Friedrich). Finally our cases demonstrated how correct Körner was when, in the introduction of his work *The Purulent Affections of the Temporal Bone*, he says that we in our operations on the temporal bone, in many respects, obtain a better insight into the process of the disease than the pathologist does from a post-mortem observation.

Case 1.—Grete R., eleven months old, from Rostock, contracted in the last days of April, 1899, without any assignable previous disease, otorrhœa on both sides.

Condition May 10, 1899. Peripheral ends of the bones of the forearm enlarged. Tibiæ and fibulæ slightly bent, fontanelles large, no demonstrable cranio-tabes, no rhachitic rosary.

The soft parts over the left mastoid process are infiltrated and posteriorly passed over into œdema extending backward almost to the median line.

No distinct swelling over the left mastoid; considerable discharge from both ears. Temperature, 40°.

Operation in chloroform, narcosis the same day.

After the inhalation of only a few drops of chloroform, and before the patient was fully under its influence, the breathing became remarkably shallow, and just as frequent as the pulse. The movements of the thorax, on the contrary, were rare; the retractions at the stomach pit and the collar-bone were quite deep. After the chloroform mask was removed, an incision was made through the infiltrated soft parts.

Only the incision of the periosteum elicited pain and better breathing. The remainder of the operation without narcosis.

The bone as far as exposed was light rose-colored and soft. A deep distinct impression from the incision through the skin and periosteum is left in the soft bone. The surface of the bone is somewhat rough.

This condition of the bone is the same as far as the squamous

portion is exposed. At the top of the mastoid, between bone and periosteum, several decaying shreds. At the first blows with the chisel the dura of the middle fossa, which was of a dark blue color, but without changes, was exposed. Further chiselling lower down. The bone was so soft that it could be readily removed with the sharp spoon.

The pneumatic cells, which are as yet but little developed, are filled partly with softened, partly with cheesy granulations from the antrum down to the tip of the mastoid process. The dura at the tegmen and somewhat laterally to it was also exposed; but the bone farther back did not contain these granulations and therefore it was unnecessary to lay the sinus bare. Everywhere in the depth where the bone was brought to view the same light rose color as on the surface was noticed.

Iodoform gauze tamponing. Outdoor after-treatment.

May 12, 1899, a swelling appeared also over the right mastoid process.

May 13*th*. The *operation*, under chloroform narcosis (this time without any interruption), showed essentially the same conditions as on the left side.

The healing process on both sides was rather slow; but otherwise showed nothing unusual.

The wounds on both sides were closed on June 10, 1899. On September 4th, discharge from both tympanic cavities stopped with the closure of the perforations of the drum-membrane.

CASE 2.—Willie H., one year old, from Gustrow. August 4, 1896, a subperiosteal abscess over the left mastoid region was incised and a bone fistula, which led down to the antrum, was scooped out. Discharged, being left in the care of the family physician for after-treatment.

January 13, 1897, the child was brought back with a recurrence of the purulent inflammation of the middle ear, reddening and swelling of scar behind ear, and also with distinct rhachitic changes at the extremities. The following was found at the operation, which was immediately undertaken:

A long incision was made between the old scar and the auricle, through soft and hyperæmic connective tissue which extended to the old bone wound, and there was replaced by granulations. The neighboring bone, as far as exposed, was found soft and rose-colored.

The whole operation was done with a sharp spoon and forceps. After-treatment by the family physician. Result unknown.

CONTRIBUTION TO THE KNOWLEDGE OF THE OTOGENOUS DISEASES OF THE BRAIN, MENINGES, AND SINUSES.[1]

I. CONTINUATION.[2]

By Dr. MUCK, First Assistant.

Translated by Dr. H. Nolte.

Case 20:—**Chronic Mastoiditic Empyema of the Endolymphatic Sac. Perisinuous Abscess. Operation. Recovery.**

W. Heinrich, twelve years old, was sent to the ear clinic on May 18, 1899.

History.—Had otorrhœa on right side since early childhood, sometimes accompanied by pain. Three years ago he had measles and five days ago a severe pain started in his right ear, radiated towards the neck and the top of the head, and was accompanied by dizziness. As he vomited yesterday and the day before, his physician sent him here.

Present Condition.—It appeared that his senses were slightly dulled by the transportation, but later, while preparing him for the operation, they again cleared up. Tongue covered with a yellowish-gray coating. Movements of eyes and pupils are normal. No facial paralysis. He presses equally well with both hands and keeps both arms extended for an equal length of time.

Above and behind mastoid process no swelling; but painfulness at the anterior border of the tip. No swelling along the course of the large blood-vessels of the neck The posterior meatal wall is not bulging. Only a segment of the drum-membrane at the handle of the malleus preserved. Tympanic mucous mem-

[1] From the Ear and Throat Clinic at the University of Rostock—Prof. Körner.

[2] See Archives of Otology, Vol. xxix., p. 172.

brane is covered with granulations. Granulations project from the attic, exuding pus.

Background of eyes normal. Pulse at the time of admission irregular. Before the operation (five hours after admission), pulse very feeble but regular, 84, temp. 36.8° C.

Operation under chloroform narcosis. Beginning according to Stacke. At the depth of 1 *cm* in the sclerosed bone a very fine fistulous passage was found exuding pus from behind. After further exposing the fistula with the chisel and bone forceps, it became evident that the fistula led from the antrum to an empyema of the saccus endolymphaticus, whose wall, which was applied to the bone, was partially destroyed. The empyema cavity contained offensive pus, had unclean walls, and was as large as a good-sized bean On its outer border it was in contact with the sinus, which in its lowest part, where it turns towards the fossa jugularis, was pushed away from the sulcus by granulations and pus. At this place the sinus wall is grayish yellow, at the knee grayish red. The sinus and the cerebellar side of the empyema of the sac were pulsating. No thrombus could be felt. The granulations in the lower part of the transverse sulcus were scraped away. The bone towards the tip being soft and filled with pus and granulations had to be entirely removed. The middle ear was fully exposed. The granulations in the tympanic cavity were removed. The hammer, whose head was greatly reduced in size and covered with minute granulations, was also removed. The incus was missing. Plastic closure of wound postponed. Three ligatures. Dressing.

May 19th.—In the evening considerable gaining; otherwise regular course. This morning, while patient was asleep, the pulse was full and regular (66 per minute). Temp. normal.

May 20th.—Pulse regular and fairly strong—88–80. Condition good, excepting slight pain in the back of his head. Temp. normal.

May 22d.—The appearance of the patient entirely changed compared with what it was at the time of admission to the clinic. Healthy complexion. During the day little inclination to sleep.

May 25th.—Condition good. To-day first change of dressings. Wound in fine condition and very little secretion.

June 9th.—Secondary plastic operation according to Körner and closure of the retro-auricular opening under general anæsthesia.

June 15th.—Outer dressing changed. Wound closed except at its lower end. Tampon in ear not disturbed.

June 18th.—Entire dressing changed. Flap has become adherent.

June 20th.—The wound cavity toward the drum somewhat narrowed by granulations. These we cauterized with lunar caustic.

June 27th.—Temp. at 4 P.M. 38.0° ; next morning 38.6°, due to an angina lacunaris.

July 2d.—Temp. normal again.

July 26th.—Cavity well epidermized, except the facial ridge and the anterior part of the tympanic cavity.

July 29th.—Epidermization complete, except at the mouth of the tube, where the mucous membrane is preserved but no longer secreting.

Hearing, whispered numbers.

"zwanzig" = 180 *cm.*
"sechs" = 100 *cm.*
"hundert" = 20 *cm.*

The tuning-fork a^1 was heard better from the vertex with the operated ear.

CHOLESTEATOMA OF THE MIDDLE EAR, AND ITS RADICAL OPERATION; WITH THE REPORT OF A CASE.

By C. ZIMMERMANN, M.D., Milwaukee, Wis.

Selected Volunteer Paper, Read before the Wisconsin State Medical Society, June 22, 1900.[1]

CHOLESTEATOMA of the ear is a globular tumor of the size of a grain to that of a pigeon's egg, of bluish-white or yellowish color, and a lustre like mother-of-pearl. Its cortex shows the structure of epidermis, and its substance consists of products of the latter, viz., cornified scales, which form concentric lamellæ, like an onion. The central portions frequently contain cheesy detritus from decaying epithelia and thickened pus, and between the lamellæ are found crystals of cholesterine, fat granules, and micro-organisms; sometimes giant cells. Its seat of predilection is the middle ear, chiefly the attic, aditus ad antrum, and the mastoid process.

There is some discrepancy of opinion as to the origin of the disease. Most pathologists identify cholesteatoma of the ear with those of the pia mater and cranial bones, which are considered as regular heteroplastic new-formations, developing from displaced embryonic cells like dermoids or atheromata (Mikulicz), or from detachments of epidermis of the first branchial arch (Kuester). Otologists, however, find this kind, the primary cholesteatoma of the ear, to be ex-

[1] This paper is admitted to these Archives because, apart from an excellent illustrative case, it gives a good description of Stacke's operation, which, though much discussed in German otological literature, is not yet so widely known and appreciated as it deserves.—Ed.

tremely rare, and consider the occurrence of cholesteatoma in the ear as secondary to chronic purulent otitis, which is always present in cholesteatoma, and caused by a conversion of cylindrical epithelium into pavement epithelium, or, most frequently, by an immigration of epidermis.

Habermann observed clinically and proved histologically the continuous growing of epidermis of the external meatus into the middle ear through perforations of the *Mt* or meatus. According to the most favored seat of cholesteatoma in the attic, this process chiefly takes place through perforations of Shrapnel's membrane above the *Mt* proper, but the same has been observed at other portions of the *Mt*.

Apparently after long-standing suppurations the cylindrical epithelium loses its faculty of regeneration, so that the epidermis, which is very resistant against the destructive influence of pus, spreads readily to places formerly covered by cylindrical epithelium. This alone, however, would not lead to the formation of cholesteatoma, since we observe such an epidermization as the result of permanent healing of purulent otitis media with large defects of the *Mt*, and therefore consider its development as very desirable. There must be some other reason for the formation of cholesteatoma which lies in an impediment of disposing of the cornified epithelium, and in an increased production of it. Panse (Haug's *Klin. Vortr.*, ii., 4) observed a slow migration of cast-off epithelial scales from the tympanic cavity of a patient on whom the radical operation had been performed, and he attributes this, as well as the excretion of scales and cerumen from the normal ear, first, to the movements of the lower jaw in mastication and, secondly, to the existence of a free passage. If, owing to peculiar anatomical conditions, the anterior wall of the meatus cannot be influenced by these movements, we have a predisposition to the formation of ceruminal plugs in the normal ear, or, if after preceding inflammations bands have developed which produce recesses and obstruct the passage, an accumulation of epithelial cells will result.

The proliferation of epithelial cells is caused by inflammation, in consequence of irritations that reach the ear from

outside, as water, instillations, etc., or the persistence of chronic suppurations in other portions of the tympanic cavity. The epidermic masses become imbibed with fluid, swell, and decay to very offensive material, and create inflammations of the surrounding tissues, periosteum, and bones, leading to caries and osteosclerosis. Even the accumulation of cornified cells alone is sufficient to destroy the bones by pressure, like an aneurism. This is characteristic of cholesteatoma, and is caused by interference with the nutrition of the bone in consquence of compression and thrombosis of the vessels of the Haversian canals. Thus the recesses of the middle ear may be converted into one large cavity, and the dura mater exposed to a great extent. Cholesteatoma is a chronic disease which may last for many years without disturbing the general health of the patient. It is a complication of chronic otorrhœa in a proportion of 1:5 (Bezold).

The *diagnosis* is made from the presence of stratified epithelium in the middle ear, which may be brought forward with the tympanic syringe or with the probe.

If left to itself, the *prognosis* is very serious on account of cerebral complications, which will result from the progressive wasting of the bone.

The *treatment* consists in removing the cholesteatomatous masses, and in healing the purulent otitis media. This may be done from the meatus, if the cavity is only small and can be inspected. If not, the whole middle ear and mastoid have to be opened, so that the cavity can be examined all over and thoroughly cleansed.

The so-called typical mastoid operation, as defined by Schwartze in 1873, *i. e.*, the opening of the mastoid process by removing the outer table of the bone, has yielded excellent results in cases of acute empyema. In the chronic form, however, it required a very long time of after-treatment to bring about a cure, which often was only temporary, as the otorrhœa persisted or relapses occurred, necessitating a second or even third operation. In such cases it aimed only at establishing a counter-opening through which the middle ear could be irrigated in order to remove morbid products from portions which could not be reached by the operation.

This uncertainty of success led surgeons and otologists to think of means to improve the method of operating.

In 1889, Kuester advised, in all cases of primary suppuration in the tympanic cavity, to remove the entire posterior wall of the external meatus as far as the tympanic cavity, so that every diseased part can be inspected and thoroughly removed with the sharp spoon. The weak point in this procedure is the regardlessness of the function of the hearing organ, not considering the possibility of injuring the labyrinth, the facial canal, or of giving rise to adhesions and stenosis of the meatus. On the other hand, it did not prove sufficient, as it did not expose the attic and the aditus ad antrum.

The observation of Ludewig, that in some cases of chronic otorrhœa the extraction of the carious hammer had to be followed by the removal of the carious incus to effect a cure, led Stacke to suppose that, if the extraction of the carious ossicles proved insufficient, the persistence of suppuration was due to caries of the walls of the attic. He, therefore, removed the lateral wall of the attic and scraped the latter. His results, however, were not favorable. The cases did not recover, unless he opened also the mastoid antrum, which could be probed from the exposed attic. From this he reasoned that it was quite natural that the suppuration of the one cavity should extend into the other, with which it directly communicates through the aditus. Consequently he relinquished the simple opening of the attic and replaced it by a new method (1890), which is called the *radical operation*, and consists in the thorough exposure of all the cavities of the middle ear—the attic, tympanum, aditus, and antrum—by removing their lateral walls.

The opinion of Stacke, that attic disease is always associated with suppuration in the antrum, is, I think, not correct to that extent. I as well as others have observed quite a number of cases of suppuration of the attic which healed after removal of the carious external ossicles and scraping of the walls of the attic from the meatus. As this is a much milder operation it ought to be done in all cases in which there are no certain symptoms of mastoid disease. Should

it prove insufficient, the radical operation may be performed later on.

Stacke's principle was generally adopted. Only the order of the steps of the operation has been modified by others. Zaufal, for instance, and Schwartze commence the operation with the opening of the mastoid process and proceed from there through the aditus into the attic, whereas Stacke reaches the antrum from the attic through the aditus. He prefers this because it enables him to ascertain the condition of the antrum by probing it from the opened attic, the diagnostic value of which, however, seems to be rather doubtful. But it certainly is advantageous in locating the situation of the antrum, which shows considerable variations in different individuals, so that it may not be found if the mastoid is opened from its outer surface, and in some cases the operation could only be finished by finally adopting Stacke's plan. Stacke, of course, also deviates from this method if the corticalis of the mastoid or the meatus show a fistula which may serve as a guide for the chisel.

The operation is done in the following manner: The incision behind the auricle is extended forward on the temporal line, and the soft parts together with the periosteum are detached until the meatus is reached. An elevatory lifts the skin and periosteum from the posterior and upper walls of the meatus as far as the drumhead, where it is severed. The hammer, if still present, is removed and the lateral wall of the attic chiselled away after introducing the "protector," so that the tegmen tympani and the upper wall of the meatus form one plane. After removal of the incus, the probe is introduced into the aditus, which is laid bare by chiselling away the upper posterior wall of the meatus. This must not be done too far downwards, lest the facial canal might be injured. The antrum, the position of which is indicated by the probe, is now opened by removing the lateral portion of the posterior wall of the meatus and the external surface of the mastoid process. Thus the floor of the antrum will form a direct continuation of the floor of the meatus. In only a few cases will it be necessary also to open the hypotympanic recessus, which Kretschmann has called the cellar.

All the cavities of the middle ear are now freely exposed to inspection and can be thoroughly scraped.

Then the skin of the meatus is used for covering the denuded bone surfaces. A horizontal incision divides the upper wall of the cutaneous meatus, which, with a vertical cut from its lateral angle backward and downwards, is transformed into a quadrangular flap. The latter is turned backwards, and pressed against the floor of the antrum by tampons of iodoform gauze. This method of transplantation has been modified by Koerner, Passow, and others.

The chief danger lies in the possibility of injuring the facial canal, which forms a ridge below the aditus, and does not run vertically downwards, but in a more lateral direction to the styloid foramen. Just above the upper posterior angle of the Fallopian canal, in the medial wall of the tympanic cavity, projects the horizontal semicircular canal, which has also to be avoided in opening the aditus.

The operation is only the commencement of the treatment. The *changes of dressing* are of paramount importance for procuring epidermization of the cavities. The developing granulations have to be dealt with in the proper way by tamponade and, if necessary, by cauterization. If the antrum is covered with epidermis, the postauricular opening may be allowed to close, so that finally the whole cavity is nothing but an extended ear canal. In cholesteatoma, which has a great tendency to relapses, it is advisable not to close the postauricular opening, so that the cavities always remain open for inspection, and can be kept open.

This course of treatment has been adopted in the following case of a man of twenty-six years. He came to me March 30, 1897, and presented the following condition :

Left ear : Very large masses of polypi projecting from external meatus. Offensive discharge ; extensive necrosis of middle ear. Removal of polypi, scraping and cauterization of the diseased walls.

Right ear : A large polypus springs from posterior wall of tympanic cavity. Attic filled with offensive cholesteatomatous matter, which was removed. After-treatment until July, 1897.

October 28, 1898, he returned, very much emaciated, with the

history that about a month ago an abscess had formed on *right side* of neck. A fistulous scar, one inch in length, commencing one and a half inches below the tip of mastoid, runs down along the sterno-cleido-mastoid muscle (Bezold's mastoiditis).

Total facial paralysis. Offensive discharge from right ear. Posterior wall of meatus bulged forward, flabby, and covers carious bone. Some cholesteatomatous masses evacuated with probe.

Left ear shows a new-formed *Mt*, with perforation through which a small polypus projects, which is taken away.

November 1, 1898, radical operation. After removing the external surface, the whole mastoid process presents itself transformed into a large cavity filled with offensive cholesteatomatous matter up to the lateral sinus and the dura mater. All the cavities of the middle ear and the posterior cranial fossa are widely opened and thoroughly scraped. A perforation of the medial aspect of the tip of the mastoid process leads into a fistula which runs downward to the fistula on the neck. The tip is chiselled away and the fistula scraped. The medial portion of the posterior wall of the meatus formed a loose sequester, which presented a semicanal, apparently the lateral portion of the Fallopian canal. The dura is largely exposed and thickened. No granulations ever developed on it; it practically exhibited the same smooth surface during the whole treatment as it shows now. The rest of the wound is covered with epidermis and scar tissue. The patient recovered very well, and his hearing is better than before.

The facial paralysis is cured; he can close his right eye completely, only the folds of the face on that side are not as deep as on the other. The after-treatment, up to complete epidermization, lasted six months. When last seen, on December 7, 1899, everything had remained well.

CONTRIBUTIONS TO THE KNOWLEDGE OF INTRACRANIAL COMPLICATIONS OF EAR DISEASE.[1]

SECOND CONTINUATION.

By Dr. WITTE, Second Assistant.

Condensed translation by Dr. H. Knapp.

Case. 21. **Phlebitis of the lateral sinus from chronic otorrhœa and mastoiditis. Pyæmia. Mastoid operation with opening of the sinus and ligation of the internal jugular. Opening of an abscess at the occiput. Death by pulmonary metastases.**

G. Schm., æt. six. Rachitis in first year. Weak constitution. Otorrhœa of both sides, without assignable cause. Syringing with boric acid water. Otorrhœa persistent. August 29, 1898, swelling behind the left ear with grave general symptoms.

Condition on admission to the clinic, August 31st: Emaciated, pale, and weakly child. Respiration, 36–40, accentuated over the whole right lung. Sensorium free. Veins greatly dilated in the right half of face and head, at the neck equal on both sides. Venous bruit weaker on left side of neck. Left ear canal filled with pus and cheesy particles; right ear canal dry. Periosteum of left mastoid somewhat swollen and very tender. Below the mastoid and at the maxillary angle slight swelling, at the neck along the large vessels neither cord nor glands to be felt. Temp. at 4.30 P.M. 39.6° C.

Operation at 5.30 P.M., 1½ h. after admission. Straight incision from above the temporal ridge along the insertion of the auricle down to the tip of the mastoid, and another horizontally backward from the middle of the former. Copious venous hemorrhage, periosteum easily stripped aside, no emissary vein encount-

[1] From the ear clinic of the University of Rostock—Prof. Körner.

ered. Superficial layer of bone slightly discolored, containing small cavities filled with pus ; deeper layers of bone more and more hyperæmic and soft ; antrum filled with granulations. The sigmoid sinus is gray and collapsed, leaving an empty space between it and the bone of its sulcus. The cerebellar and cerebral dura mater is discolored in like manner, making it difficult to recognize the limits of the sinus. The pulsations of the dura are easily seen and felt. On incision the sinus was found empty at its knee, farther backward it contained a coherent, reddish thrombus ; no pus anywhere. An incision downward was followed by copious hemorrhage, requiring tamponing (iodoform gauze). Now the jugular was tied, with catgut, directly above the entrance of the facial vein. The jugular proved intact, containing fluid blood. Cervical wound partially sutured.

9.15 P.M.—Pulse 128, regular, full ; resp. 36 ; temp. 38.5° C.

September 1st.—Night restless. Condition of patient essentially the same. Eyes functionally and opthalmoscopically normal. Pat. has neither opisthotonus nor stupor, cough nor expectoration. Wound nothing notable. At the nape of the neck a little below and to the right of the occipital protuberance painful, not fluctuating swelling. In the eve., temp. 38.5°.

September 3d.—4 A.M., temp. 38.0° : 4 P.M., 40.2°. No chill, no perspiration.

September 4th.—Restless night, complains of pain in back of head, and touches the places frequently with his hand. Sensorium free, no vomiting.

7.30 A.M.—Anæsthesia ; opening of several small, superficial abscesses at occiput, communicating with one another by long fistulous passages underneath œdematous skin. The tissue underneath the abscesses is discolored, ragged, and decaying. During the operation several brown diarrhœic evacuations of bowels. After the operation pulse 180. Great pallor, lips blue ; sensory clear ; great agitation. Death, 10.30 P.M.

Autopsy : Some clear, yellow liquid in abdominal and pericardial cavities. In both pleural cavities, adhesions, in the right 150 *ccm* of turbid liquid.

Upper lobes of both lungs free from focal changes with good supply of blood and air. In lower lobes several foci, the size of a walnut, softened, greenish, and offensive in centre, with small mantles of hepatized grayish-red or purulent pulmonary tissue. Spleen two or three times the natural size.

Pia mater of the brain somewhat thickened in parietal region.

Right lateral sinus normal, left containing gray-red, soft, not quite obturating thrombi. The walls of the sigmoid sinus and the adherent thrombus, gray-green and soft. The thrombus extends into the jugular bulb and the upper end of the jugular vein, without obliterating either. The cervical wound is patent, and leads into a cavity, the size of a walnut, filled with sanious liquid, and surrounded by discolored, disintegrating walls.

Remarks: The operation came too late. It was undertaken as a last resort in a desperate case.

CONTRIBUTIONS TO THE KNOWLEDGE OF INTRACRANIAL COMPLICATIONS OF EAR DISEASE.[1]

THIRD CONTINUATION.

By Dr. MUCK, Assistant.

Translated by Dr. Max Toeplitz, New York.

(Vol. xxxv., p. 12, 218, and 317 these Archives, German Edition.)

22. Cerebellar and extradural abscess in the posterior cerebral fossa which had run its course without marked symptoms, and was found and emptied during operation of an acute suppuration of the temporal bone. Recovery.

F. Adolf was admitted to the hospital on April 7, 1900. He could not before follow the repeated advice of his physician, Dr. Schroeder, to be operated at the clinic owing to serious disease of his wife. In February he had an attack of influenza, which had led to suppuration of the right ear. His physician, who had not been consulted until March 29th, had found: "Intense deafness in R. E. Watch on contact only, whispered voice close to the ear. Profuse suppuration. Granulations posteriorly and above in the external meatus. Mastoid process upon pressure slightly sensitive, the whole somewhat swollen." His physician removed the granulations from the external meatus and gave the patient the above-mentioned advice, which was not followed until April 7, when the **following condition** was recorded at the clinic: Intense infiltrations of the soft tissues behind the auricle, extending, œdematous, upward and forward above the zygomatic arch. Fluctuation not demonstrable. In the external meatus very little

[1] From the Aural and Laryngeal Clinic of the University of Rostock.

pus and at the bottom, granulations attached postero-superiorly. Miserable appearance, yellowish-gray complexion ; pulse regular, full, 80 beats per minute.

The patient would not even now remain at the clinic, but once more travelled to his dying wife ; however, he promised to return on the following day under all circumstances for operation. In order to be injured the least by this delay, the swelling upon the mastoid was immediately incised (without narcosis), whereby profuse suppuration was discharged from a subperiosteal abscess connected with a bone fistula.[1]

The patient returned on the following day after taking leave of his dying wife and was immediately operated.

Operation on April 8th : The wound, made by incision on the day before, was enlarged above over the temporal line. The cortex was denuded upon the mastoid pit and presented closely behind the spina supra meatum, a perforation which led into a cavity filled with pus and granulations as far as the antrum. The bone of this cavity was destroyed up to the dura of the middle cerebral fossa, the upper wall of the cavity being formed exclusively by the discolored dura devoid of granulations. A fistulous path led from the cavity backward. In exposing this path with the chisel, suddenly about a tablespoonful of pulsating pus gushed out. After the discharge of the greatest part of this, pus regurgitation took place following every pulsating propulsion. The fistulous path led into the posterior cerebral fossa. By enlarging the canal with chisel and forceps, the dura, uniformly studded with granulations, was laid bare medially from the sigmoid fossa. The exposed dura cerebelli presented pulsating movements, and with each pulsating rise, pus welled out from an opening situated in the dura between granulations. A probe, cautiously introduced into the opening, met soft resistance, only at a depth of 2 *cm.* The cerebellar abscess was drained by a small strip of gauze and loose plugging of the osseous wound. The background and muscular movements of the eye, examined the same evening, were found normal (Dr. V. Zelewsky).

On the day following the operation the temperature rose to 37.6° C., later never exceeded 37.2° C. Six days after opera-

[1] The advantage of this immediate incision by Dr. MUCK, who operated on this case during my absence, was demonstrated at the operation performed after the return of the patient. The bone abscess had prepared a path into the cerebellum, and through the incision of skin and periosteum the cerebellar pus had been emptied. KOERNER.

tion the drainage tube was removed from the cerebellum. The healing of the wound and of the perforation in the drum membrane took place without disturbance, with preservation of good hearing, and was completed on June 8th, viz., in two months.

23. Extradural abscess of the middle cerebral fossa in acute mastoiditis after measles and angina. Operation. Recovery.

K. Walter, four and one half years old, on December 1st, was seized with measles which, after disappearance of the exanthema, were complicated with angina. Otalgia did not occur in the L. E. until December 21st. On the following day, some fluid was discharged from the ear, and, simultaneously, a swelling was noticed behind it.

At the first consultation, on December 23d, the **following condition** was found: Firm infiltration upon the base of the left mastoid process, pushing forward the upper portion of the auricle. The external meatus was filled with macerated and swollen debris. After cleansing, no perforation visible. The membrana tympani was covered with swollen epidermis, bulging postero-superiorly. Malleus not discernible. An incision, made into the bulging part, liberated profuse, clear serum. The wound did not bleed. Ice-bag.

December 24th swelling decreased, discharge purulent. Temperature of from 37.9° to 38.4° C. Admission to the clinic.

On December 25th, swelling and suppuration increased. Fluctuation demonstrable in the evening. Temperature of from 38.0° to 39.3° C.

On December 26th, **operation**: Incision through the swelling up to the insertion of the auricle. Intense infiltration of skin, subperiosteal abscess extending into the osseous external meatus. Bone: Corticalis devoid of blood, and perforated in the mastoid pit. The superficial pneumatic cells contain swollen mucous membrane and some pus. At a greater depth the bone is hyperæmic and brittle. This softening extends into the antrum and to the dura of the middle cerebral fossa, which is covered with granulations, and detached by pus from the bone.

Temperature in the morning (before operation), 37.4° C.; in the evening, 37.6° C.

From December 27th to 31st, irregular fever, between 37.4° C. and 39.2° C. Wound presents gray deposit, and again from January 4th to 6th. From now on course without fever, but markedly

slow recovery. Treatment very much interfered with by the naughtiness of the patient. In March there is still a fistula in the scar of the wound, from which, as well as from the perforation of the membrana tympani, viscid mucus is discharged, which can be removed only by the syringe. The fistula and perforation of membrana tympani do not close before May 3d, but five days later the scar reopened. On May 17th complete recovery.

24. Extradural abscess in the middle cerebral fossa; mastoiditis from scarlet fever. Operation. Recovery.

K. Hertha, twelve years old.

History: At the end of April, scarlatina; since beginning of May, bilateral otorrhœa; swelling of the right mastoid process of a week's duration.

Condition on admission: Redness, swelling, and pressure; pain of the right mastoid process, and particularly above the auricle, extending far into the temporal region. Profuse suppuration R. and L.

Operation (May 31, 1895, under ether): Incision beginning 1.5 *cm* above the temporal line, and down to the mastoid apex. Detachment of the periosteum back and forward, whereupon, above the external meatus, about 10 *ccm* of pus gushed out. Elongation of incision anteriorly and above. Squama of temporal bone is carious to great extent, and at one place perforated by fistula. The diseased portions are completely removed, whereby a portion of the dura of the size of a phalanx of the little finger is exposed in the middle cerebral fossa. It was covered with pus, but free from granulations. The mastoid planum had a reddish color. The sharp spoon readily entered through the soft corticalis into a cavity filled with pus and granulations; the cavity was then properly laid bare with the rongeur. Dressing with iodoform gauze.

On June 18th, redness and swelling occurred at the *left* mastoid process. Operation on the same day. In detaching the periosteum the chisel discovers softened granulations closely at the posterior wall of the mastoid process. From this place a cavity, filled with pus and granulations and larger than a walnut, is laid bare, which extends far forward and upward. Plugging.

On September 3d, complete recovery on both sides.

The backgrounds of both eyes had been normal during the entire period of observation (Dr. Crull).

25. Extradural abscess in the posterior cerebral fossa in relapsing suppuration of the middle ear. Operation. Recovery.

E. Christian, sixty-nine years old.

History: In 1884 the patient was seized in Constantinople as a marine soldier with "climatic fever." On May 12, 1897, he was treated at the out-door department for suppuration of the *left* middle ear. The suppuration was said to have started six weeks before the beginning of the treatment. It is doubtful whether the suppuration of the middle ear had then been healed, as the patient had withdrawn from treatment.

On August 7, 1898, he returned to the aural clinic on account of intense earache.

Profuse suppuration from the left ear. The disease was supposed to have begun at the end of July.

The treatment of the suppuration of the middle ear was unsuccessful. On September 14th the patient complained of intense pain behind the left ear. The patient was admitted to the clinic for operation.

Present condition: The left mastoid process is sensitive upon pressure, and the soft tissues above it are swollen. In the external meatus much pus. The posterior wall of the external meatus is not sagging.

Temperature: at noon and in the evening 39.6° C.

Operation on September 15, 1898, in chloroform narcosis:

Incision over the left mastoid, ½ *cm* behind the auricular insertion, from the temporal line to the mastoid apex. Periosteum detached forward and backward. Bleeding spots upon bone in mastoid pit. The first chisel strokes evacuated pus under high pressure.

After exposing the sinus at its knee an extradural abscess, containing about a tablespoonful of pus, was emptied under high pressure. The sinus wall was covered with discolored granulations. The overhanging cortex, chiselled off below the temporal line, laid bare a fistulous path, the size of a pin, which, when followed up, led into a pretty small antrum which was curetted. Dressing with iodoform gauze.

After curetting a softened area of the bone around the antrum on October 20th, which had kept up the suppuration for a time, the healing of the operated wound was completed by the end of December, and the tympanic cavity had become dry.

26. Extradural abscess in the posterior cerebral fossa in acute suppuration of the temporal bone. Operation. Recovery.

L. Heinrich, forty-eight years old, was seized at the end of February, 1900, with pains in the left ear. After enduring for two weeks this agonizing pain, which deprived him of sleep, otorrhœa set in and brought great relief. With the persistence of profuse suppuration, however, soon frontal headache appeared, which became more and more intense.

On April 6th, six and one half weeks after the beginning of the disease, the patient came to the clinic in the **following condition** : Paleness, coated tongue. Profuse suppuration from the left ear. Perforation of the membrana tympani in the postero-inferior quadrant. Bulging of the postero-superior wall of the external meatus. Periosteal swelling and sensitiveness by pressure upon the mastoid process. Temperature normal. Background of the eye and temperature normal.

Operation on the day of admission (Dr. Muck) :

Periosteum of the mastoid process thickened, firmly attached to the bone. Cortex yellowish with many blood spots. The cavities of the bone under the cortex had a discolored lining, and at a greater depth up to the antrum were filled with granulations and pus. The granulations extend to the dura of the posterior cerebral fossa. When they were scraped out about a teaspoonful of pulsating pus welled out between dura and bone. The dura exposed to the extent of a ten-cent piece is partially covered with granulations. Removal of the undermined bony edges. Insufflation of iodoform boric-acid powder. Plugging.

Undisturbed recovery without fever, with occlusion of the perforations of the membrana tympani and with good hearing.

May 10th.—Healed, thirty-four days after the operation.

27. Extradural abscess in the posterior and middle cerebral fossæ, with phlebitis and thrombosis of the lateral sinus, after suppuration of the middle ear without destruction of bone in the temporal. Operation. Recovery.

M. Albert, nine years old, was sent on October 22, 1890, by Dr. E. to the aural clinic with the following accompanying letter : " Last year the patient suffered from suppurative otitis media for a long time. Since October 12th, intense pain around the left ear, in the left upper eyelid, the left cheek, and the left lower jaw. Temperature ranged from 38.5° to 39° C. Various remedies have been used without avail for the pain."

On Admission the somewhat pale, but quite robust boy had a temperature of from 37.5° to 37.8° (evening) C. There was torticollis on the left side. No swelling of mastoid and no sensitiveness upon pressure. Left membrana tympani grayish-white and bulging. Numerous injected vessels were discernible with the magnifying glass. Thick pus was liberated by paracentesis. The following day the torticollis and the intense pain in entire left half of the head and at the upper lid had disappeared. Between mastoid and occiput there was fluctuation in a place surrounded by œdema which did not extend forward to the mastoid. By an immediate incision pus was removed and granulations were scraped off. The small sharp spoon did not reveal rough bone, which, however, was discovered in the evening with the probe. Background and muscles of the eyes normal. During the following days the patient's subjective and objective condition was good. Temperature normal, except on one day, October 25th, when it rose to 38.2° C

Oct. 29th.—The wound made by the paracentesis was dry. The œdema around the incision of the occiput had disappeared; the wound itself presented a grayish-yellow deposit and scanty secretion. The probe revealed rough bone to greater extent, but did not enter into it.

Oct. 30th.—**Operation** in chloroform narcosis. While curetting the wound made previously by incision over the parietal bone, profuse pulsating pus was discharged at once. The fistula situated at the antero-inferior portions of the parietal was enlarged by removal of portions of the bone with the forceps, whereby extradural pus continually escaped. Removal of the bone with forceps as far as the sigmoid sulcus of the temporal bone. The sinus in the sulcus was collapsed and farther backward covered with dense granulations. Irregular, slow pulse, of poor quality and repeated cessation of respiration, necessitated interruption of operation. Dressing with iodoform gauze.

The condition of the patient after the operation not bad: the pulse was small, somewhat irregular, 70 beats per minute, in the evening stronger and regular; temperature normal.

Oct. 31st.—Good condition. Pulse regular, 88. Appetite poor.

Nov. 1st.—Background of the eye normal.

Nov. 3d.—Change of dressing; good appearance of granulating surface of dura and sinus. Perforation of membrana tympani dry and smaller.

Nov. 5th.—Good condition. Eye normal.

Nov. 8th.—Change of dressing. Healthy granulations except those in the lower angle of the wound (region of sigmoid sulcus), which are grayish-yellow. Pulse regular.

Nov. 11th.—Pulse again somewhat irregular; November 12th, regular.

Nov. 15th.—Uniformly granulating surface of good appearance.

Nov. 24th.—Change of dressing. The granulating surface considerably reduced.

Dec. 2d.—Discharged cured. Perforation of membrana tympani closed.

Remarks: The operation exposed an extradural abscess, which had extended over a portion of the occipital lobe, and half of the cerebellum. The transverse sinus was in the province of the abscess covered with granulations, and was undoubtedly thrombosed since its collapse was farther in front viz., centripetal. The extradural abscess had found its way outward through the bone. It could not be positively ascertained whether the intracranial suppuration had originated from the suppuration of the middle ear, observed and removed by us, or from that of the year before. The former view is now probable. The pathway of the pus, which had at one time apparently existed between tympanic cavity and intracranial abscess, could not be found. A destruction of bone in the mastoid connecting both suppurating areas was entirely missing. Furthermore, it is left undecided whether the disease of the sinus had produced the extradural abscess or this the sinus disease. The absence of optic neuritis with a large extradural abscess and the occlusion of the sinus is remarkable. The healing of the sinus phlebitis by emptying the perisinuous abscess without opening the sinus is not unusual.

28. Chronic mastoiditis, sinus-phlebitis and leptomeningitis purulenta. Unsuccessful operation. Death. Autopsy.

K. Hans, eight years old, was sent to the Rostock University ear clinic on November 22, 1899, on account of a suspected brain abscess, following an otitis media suppurativa.

History: The duration of the suppuration from the *left* ear is uncertain. Four weeks ago vomiting, since then considerable prostration and pallor. Vomiting frequently repeated. Five days ago general convulsions with continuous outcries, lasting several hours; since then left facial paralysis and paresis of the left arm.

Condition on admission: Pallor of skin and mucous mem-

branes. Complete paralysis of the face branches of the left facial. Left arm paretic.

Left hand somewhat œdematous. Numerous petechiæ upon neck, breast, and abdomen. Pulse 132, small, but regular. Temperature 36.5° C. Sensorium clear, answers are slow and a long time after the questions. External meatus closed by several furuncles. Between the furuncles blood and pus.

Background of eye: R., choked disc; L., the same, besides extensive hemorrhage, in the region of the disc. Corneal epithelium defective in consequence of facial paralysis. The left sterno-cleido-mastoid muscle so tight as to render the palpation of deeper structures impossible. Skin veins of both sides of neck alike. In the region of the left mastoid emissary vein, nothing extraordinary. (Supplementary note after operation: Under narcosis, the sterno-cleido-mastoid relaxed; the gland under its upper third could be felt.)

No albumen in the urine.

Operation: On the same day, under chloroform narcosis, during which respiration ceased and artificial breathing had to be induced.

Radical operation: The bone was found soft and brittle, but not until the antrum was reached. Granulations in antrum and tympanum.

A fistulous passage led through the bone from the antrum to the sinus, which was found to be covered with granulations in the entire sigmoid curve. By means of the cutting forceps, the sinus was exposed as far as it was covered with granulations, and then slit open. Recent, non-suppurative thrombus; no blood. Region of sinus and cerebellum did not pulsate. By two incisions into the cerebellum much cerebro-spinal fluid and blood were let out. After the puncture, the cerebellum began to pulsate. Owing to collapse, hasty plugging and dressing; injection of chloride of sodium into the rectum; elevation of legs, hypodermic injections of ether.

Nov. 23d.—During the night a great deal of crying and groaning; in the morning the dressing was soaked with cerebro-spinal fluid. His condition was comparatively good until now, for the patient heard, when called, took some nourishment, and was quieter than during the night; he grew considerably worse in the afternoon, stupor.

The œdema of the left hand increased. Slight œdema at the

upper lids, probably through pressure from the bandage. The condition of the background of the eye, ascertained yesterday by Drs. Krukenberg and Plant, is to-day confirmed by Prof. Axenfeld. Temperature in the morning 37.4° C., in the evening 40.2° C. Pulse, 160 beats.

Nov. 24th.—Essentially the same condition as yesterday. The outer dressing was again saturated with cerebro-spinal fluid. Temperature varied irregularly between 37.9° C. and 40.2° C.

Nov. 25th.—Patient gave the physician, on request, his formerly paretic hand. When it was placed above the head, he took hold of it with the right hand, in order to take it down. Facial paralysis unchanged. Œdema of the left hand less. During the afternoon extreme restlessness; grasped at the dressing. Petechiæ upon the body not increased. Temperature between 39.1° C. and 40° C.

Nov. 26th.—During the night quieter; prolonged sleep. Sensorium appears less dull. Fœtor ex ore. Temperature of from 38.5° to 40.4° C.

Nov. 27th.—During the night great restlessness, a good deal of crying; no sleep. Sensorium dull. In the morning change of dressing; wound discolored, without granulations, without pus.

Gauze entirely soaked with cerebro-spinal fluid. Patellar reflexes absent. In the afternoon marked opisthotonus. Temperature from 38.6° C. to 40.6° C. Pulse, 140.

Nov. 28th.—Ophthalmoscopic condition as before. Opisthotonus still remaining.

Until Dec. 1st no essential change, then twitching in the right leg, conjugate deviation of eyes toward the left. Convulsions in the right arm continuing for some time. Opisthotonus marked.

In the afternoon: Respiration irregular; after a few consecutive respirations, superficial breathing; later on respiratory intervals lasting up to thirteen seconds. Convulsions in extremities and maxillæ.

Dec. 2d.—Abdominal, cremaster, and corneal reflexes absent. Convulsions less frequent, pulse regular, 180, arhythmic toward evening. Respiration irregular and superficial. Incontinentia urinæ et fæcum. Trismus.

Dec. 3d.—The same condition.

Dec. 4th.—No more trismus and opisthotonus. No convulsions. At 6.30 P.M. exitus letalis.

Autopsy (Dr. Ricker, Abridged Report): Thin cadaver of pale complexion. Petechiæ on neck and chest.

In the posterior cerebral fossa about 20 *ccm* of fluid rendered turbid by pus. R. sinus transversus contains some fibrinous coagulations (buffs). Pia of the base covered and infiltrated with tenacious green pus, particularly at the cerebellum, pons, and medulla. In the fossa Sylvii, the purulent infiltration extends equally to both sides. The inner surface of the dura of the convexity, pale, smooth, and moist. In the longitudinal sinus some buff. Pia of convexity in its entire extent opaque, on the left side, particularly at the cerebellum, on both frontal lobes pia much congested. Left lateral ventricle much enlarged, containing turbid fluid mixed with pus.

R. ventricle the same condition. After removal of the contents, ependyma smooth and well filled with blood; the third and fourth ventricles also enlarged with the same contents. Cerebellum contains little blood, is tenacious; no focal or macroscopic changes in central ganglia, pons, and medulla. Extensive, partly pigmented, adhesions in entire abdomen. Hard tumors of spleen. Pleuritic adhesions anteriorly in the right pleural cavity. Epicarditic hemorrhage of the size of a lentil.

EXAMINATION OF THE TEMPORAL BONE.

(PROF. KOERNER).

Section with the fret-saw parallel with external surface of the temporal bone, passing somewhat medially from antrum and separating the medial from the lateral portion of the tympanic cavity.

In the tympanic cavity, the malleus unchanged, but completely detached, the incus absent; the stapes without limbs, its plate dislocated, apparently through section with saw; the facial canal is open at medial wall of tympanic cavity; pus in porus acusticus internus and in vestibule.

Cerebral side of temporal bone normal, in the posterior cerebral fossa opening from operation. Sinus transversus in sigmoid fossa opened, sinus wound discolored at edges. In the sinus only buff. In bulb of jugular vein near the tympanic floor, non-disintegrated grayish red thrombus. Bony wall of jugular fossa completely intact.

Remarks: The presence of a purulent leptomeningitis, suspected as early as the time of admission, has been confirmed by the further course and autopsy. An immediate operation was resolved upon, owing to the possible existence of a deep-seated

cerebellar abscess (simultaneous paresis of the arm) with septic general infection from the sinus. In this case the patient could have been possibly saved by an immediate operation. Lumbar puncture, through which the incurable meningitis could have been detected, was omitted, since the seriousness of the disease did not admit of any delay, and, in the worst case, it could be hoped that the operation would at least lessen the pain of the patient.

29. Otitic phlebitis of the lateral sinus with pyæmia and sepsis. Extension by starts of the phlebo-thrombosis into the sinus, internal jugular, and anonyma.

D. Wilhelm, eighteen years old, was on March 13, 1900, sent to the aural clinic.

The history of the patient revealed that he had suffered for a year from a suppuration of the *right* ear, which had persisted without interruption, not very profuse, and had never caused any pain. Intense pain did not appear until March 7th in the right ear and the head, when it set in with considerable vertigo and, on March 10th, with vomiting additionally. His physician, who first saw him then, reported as follows: "Temperature 40° C., pulse irregular, complaints of intense headaches, slight sensitiveness of the mastoid process. After cleansing the external meatus of offensive masses, his condition was considerably improved and the temperature fell to 37.4° C. and 38° C. To-day (March 12th) in the afternoon 41.0° C."

Condition on admission (March 13th): Wretched-looking young man; vacillating gait; inclination with eyes closed to fall toward the diseased side. Sensorium free. Pulse regular, 128 beats per minute. Soft tissues covering the right mastoid process without changes. R. apex painful upon pressure; marked tenderness to pressure in the region of the mastoid foramen. Movements of head painful. Passive movements of the head when tried are warded off by the patient with the hand. In the right external meatus plug of gauze with scanty pus.

Membrana tympani: R. perforation postero-superiorly; scanty pus. L. normal. Background and muscles of the eye normal. No paresis of the arms, legs, or facial. At the right side of neck no cord could be felt. External jugulars of both sides equally well filled.

Operation on the same day:

Chiselling according to Zaufal. Periosteum easily detached. Several blood spots in the cortex; close below which large cavity filled with pus, its posterior wall being formed, to the extent of about a 25-cent piece, by cerebellar dura and sinus.

A fistulous passage leads from the cavity to the antrum, filled with granulations and epidermis masses. Between the granulations the incus is found with shortened processes, the malleus being absent. The labyrinthine wall is intact. The extradural abscess cavity is still more exposed toward the knee of the sinus. The sinus appears to be grayish-red and hard, and the dura presents a dirty grayish deposit. Plugging with iodoform gauze. Dressing.

During the first three days after operation the patient's subjective condition was good; there existed slight irregularity of pulse and temperature, the latter varying between 35.9° C. and 37.5° C.

During the two subsequent days (on March 17th and 18th)—viz., on the fourth and fifth days respectively after operation—the temperature assumed a pyæmic character. Every rise took place without chill. On March 19th, therefore, the *jugular was ligated.* It could be found but with difficulty, since it was empty, and collapsed in form of a thin cord. In dissecting it out, it was incised lengthwise and bled from below — double ligature and cutting between. During the same narcosis the sinus was more exposed in both directions, and found to be covered with granulations. Incision of the sinus at the knee. Curetting of a soft, non-suppurating thrombus. Plugging with iodoform gauze.

After ligation of the jugular, the pyæmic fever continued; it rose with chills and fell with profuse perspiration. Vomiting occurred before the first chill.

The frequency of the pulse markedly corresponded with the course of the temperature. The divergence of the pulse and temperature curves did not take place until shortly before the exitus letalis.

On March 24th, the background of the eye was examined for the last time, and found to be normal. From March 26th the sensorium was at times dull.

March 30th, icteric discoloration, and during change of dressing painful infiltration of the soft tissues, extending to the occiput, were noticed laterally at the neck.

The partly closed wound of the neck, therefore, was opened, whereby an abscess in the subcutaneous tissue was emptied. On

the following day (March 31st) intense somnolence, interrupted by deliria, set in, followed by the exitus letalis at noon.

Autopsy on April 1st (Dr. Ricker): Emaciated cadaver, icteric discoloration, abdominal integument not discolored, a few death spots. No œdema. Behind the ear and at the inner side of the sterno-cleido-mastoid muscle the operation-wound closed by plugs. Abdominal cavity, diaphragm, pericardium, and heart normal. The right pleural cavity contains 20 *ccm* of clear yellow fluid.

The left lung large and heavy, pleura at most places smooth. At the anterior side of the upper lobe in its centre a prominent area of the size of a nut, where pleura is covered with fibrin; somewhat lower down a smaller diseased area. At the edge between the two lobes, and also at the base and at several other places, thin fibrinous deposits. Upon transverse section both lobes appear quite vascular, without œdema. With the first-mentioned area corresponds an abscess of the size of a small pinhead, in the surroundings of which, to the extent of 1 *cm*, the pulmonary tissue is devoid of air, showing a hemorrhagic infarctus. Furthermore, in the upper lobe, there is found an abscess of the size of a pinhead, also with hemorrhagic surroundings. Bronchi with muco-purulent contents; arteria pulmonalis empty.

Right lung larger and heavier than the left. Pleura smooth. Upper lobe with diseased area, of the size of a hazel-nut, covered with fibrin. At several places fibrinous deposits. Upon the transverse section both lobes quite vascular, slightly œdematous, upper and lower lobes moderately pneumatic, corresponding to the diseased area in the upper lobe; there is a *group of abscesses of the size of pin-heads with hemorrhagic surroundings.* In the lower lobe at the anterior side an area of the size of a millet-seed of the same character; bronchi with mucous contents, mucous membrane quite vascular and smooth. Pulmonary artery contains clots.

Spleen enlarged from two to three times its natural size, serosa smooth; moderately vascular upon transverse section.

Fat capsule of left kidney moderately developed; surface and transverse section pale; icteric discolorations marked.

Right kidney more vascular, cortex pale. Duodenum with dull contents. In the stomach towards the cardia a place of the size of a palm with hemorrhages and extreme injection.

Liver large. At ileum near valve, several calcified glands. In the beginning of cœcum and colon a number of pigmented follicles.

After the removal of plug at the inner side of the sterno-cleido-mastoid, a cavity of the size of a walnut with purulent deposits and purulent surroundings. The jugular is exposed and opened below the place of operation. It contains a clot with a fibrinous layer at the surface. The entire clot is somewhat softened, discolored, and continues downward into the subclavian. The jugular stops above with rounded end. One cannot enter the wound cavity from the jugular with the probe.

In the wound cavity farther upward a ligature is met, which, when incised, presents above the continuation of the jugular. Description follows later on.

The other wound cavity (behind the ear) is at first limited by soft tissues, then by bone, and leads far inward. Abscesses thence extend downward, partly in the sterno-cleido-mastoid, to the level of the cricoid cartilage, and also some are found in the neighboring lymphoid glands.

In the posterior cerebral fossa there are a few *ccm* of clear fluid. The dura of the base is not very vascular, is smooth and moist. In the posterior two-thirds of the right transverse sinus clotted blood. In removing the dura at the posterior side of the right petrous bone, a defect of the size of a quarter is exposed in the bone, which leads outward into the other operated cavity. The dura is here transformed into a thick layer of cicatricial and granulation tissue and thus limits the cavity toward the rear.

The lateral sinus cannot be found at this place; it ends in the fibrous tissue near the thickened portion of the dura.

The carotid is unchanged; from the above-mentioned place of ligature of the jugular upward, a thickened vessel takes its course, corresponding in its position with the jugular, embedded in suppurating tissue, the inner surface of the vessel being covered with a red, partly softened thrombus; the masses of the thrombi can be readily separated from the wall.

After removal of the petrous bone, the suppuration is seen to extend to the foramen occipitale magnum; the purulent infiltration of muscular and fatty tissue reaches anteriorly the pharynx; also in front of the vertebral column, in the region of the upper cervical vertebræ, the muscles and connective tissue are intensely suppurating.

The pia of the cerebellum is not vascular and without œdema, that of the convexity more so and œdematous. The lateral ventricles of corresponding width with clear fluid. Ependyma un-

changed. The choroid plexuses of a medium amount of blood, also unchanged. Third and fourth ventricles like lateral ventricles.

Cerebellar and cerebral hemispheres pale, of quite firm consistence, also central ganglia. Pons and medulla free.

The petrous bone, removed with surrounding parts, presented the following condition :

The incision made at the knee of the sinus was situated quite far forward, not at the lateral wall of the sinus. Above the place of incision, toward the cerebrum, the sinus is obliterated by an organized thrombus. The place of incision extends heartward into a defect in the sinus wall which reaches the foramen lacerum.

The defect is situated in the part of the sinus wall opposite the bone and is here connected with a place, at which the dura is detached from the bone by pus to the extent of a bean. This extradural abscess extends into the jugular fossa, where it completely compresses the bulb, below which the jugular, as far as the ligation, is filled by a discolored thrombus, and the wall is in one place perforated by ulceration. This thrombosed half of the lugular is surrounded by several periphlebitic abscesses.

Remarks : The most remarkable feature of this case is the extension by starts of the infectious thrombosis. The internal jugular at the operation was found to be completely collapsed and so thin as to cause doubts as to its real presence. In further exposing the vessel, a longitudinal incision presented the lumen and caused a slight hemorrhage from below, viz., against the direction of the blood current. When, after the double ligation and the cutting through the vessel, the lateral sinus was opened in the sigmoid fossa, a parietal thrombus was found. The autopsy revealed the fact, however, that the portion of the jugular from the collapsed place of severance in the direction of the heart, also contained a discolored thrombus, which extended into the vena subclavia.

This thrombus, situated far away from that in the sinus, and separated by the complete collapse of the middle portion of the jugular, and by the double ligation and cutting through the vessel, was probably in existence at the time of ligation and division. The ligation toward the cerebrum could not prevent the further transportation of infectious material into the blood current.

How may this periodic extension of thrombosis have been caused ? The sinus wall was first diseased, where it was contiguous with the suppurating bone. Could a remote place of the inner wall of the jugular have been infected by micro-organisms circu-

lating with the blood current, or could germs originating in the sinus migrate through the jugular and heart, in order to remain retained in the small nutritive vessels of the veins (the vasa vasorum) and thus produce an embolic metastasis in the jugular wall with subsequent thrombosis of this vein?

30. Pyæmic fever in bilateral otitis from measles. Recovery without operation.

E. Bruno, four years old, was sent to the clinic on May 23, 1900.

History: Six weeks before admission the boy was seized with measles. After a week, both ears began to discharge profusely without preceding pain, the cervical lymph glands swelled considerably, and the urine contained albumen. For ten days there existed intermittent fever (in the morning mostly 36° C., in the evening 40° C., and more in the rectum). Chills and perspiration were missing. The boy was rapidly emaciating.

Condition on admission, on May 23d: Extreme emaciation and pallor. Tongue with gray coating. Background of eye normal. No paralysis of facial. At the neck small glands can be felt at different places. In both jugular regions no cords are present. Both external jugulars equally filled. All joints free. Heart and lungs normal. No albumen in urine. Spleen not palpable. Temperature (in recto) at noon, 37.0° C., at 8 P.M., 40.3° C. Pulse regular, accelerated. Sensorium free. No pain. Palpation and percussion of both mastoids reveal normal conditions. Right membrana tympani whitish, lustreless, and thickened, malleus not discernible. **Paracentesis** brought forward nothing: no pus, not even blood. The left membrana tympani covered by scanty pus. After syringing the external meatus a perforation of the size of a millet seed presented itself anteriorly and below, and a bulging posteriorly and above, which bled when incised. Gauze strips in both external meatuses; dressing.

May 24th.—Temperature normal. Right external meatus dry. Gauze strip in left meatus moistened by scanty sanguinolent discharge; no pus.

May 25th.—Temperature, at 8 A.M., 36.8° C., at 2 P.M., 39.8° C., at 10 P.M., 37.2° C.; on May 26th at 4 A.M., 35.6° C.; highest temperature on this day, 36.9° C. The rapid rise of temperature on May 23d and 25th ensued without chill, the fall without perspiration.

From now on, uninterrupted normal temperatures were present. The strength and general condition rapidly improved and the suppuration of the middle ear did not return. The patient was discharged on June 8th.

On June 13th the boy returned to the clinic on account of fresh pain in the left ear. He had no fever. At the extreme end of the left external meatus stenosis, sensation upon pressure, caused by diffuse swelling, in the meatus some watery fluid, slight œdema in the auricular fold; evidently an otitis externa. The ear was syringed with a solution of sublimate (1:1000), a gauze strip saturated with a two per cent. solution of carbolic acid was loosely introduced, and a protective dressing applied. The next day the œdema had disappeared from the auricular fold and the green color of the gauze strip revealed the pyocyaneus as the causative agent of the external otitis.

Plugging of the meatus with a five per cent. solution of nitrate of silver cured this additional infection in two days.

Remarks: It cannot be decided whether there existed pyæmia due to osteophlebitis in the petrous bone, to marginal or even occluding thrombosis of a sinus contiguous with the petrous bone, since the patient was cured without operation. For the following reasons no operation of the petrous bone and sinus was considered: The suppurations of the middle ear had been on the decrease when the patient came to the clinic; there was no sign of disease in the petrous bone, none of metastasis; finally a lack of knowledge which ear had caused the general infection. The omission of the operation was justified by the favorable course.

31. Acute osteomyelitis of the pyramid of the petrous bone with retropharyngeal abscess by gravitation and extradural abscess upon the pyramid of the petrous bone. Several operations. Recovery.

Sch. Johann, forty-eight years old, at the end of September, 1898, was seized with intense pain in the left ear, which extended over the entire left half of the face. Simultaneously there was extreme deafness and continuous beating in the left ear. About a week previously the patient had contracted a severe cold, manifesting itself by considerable stupor and coryza. There was no otorrhœa.

His physician ordered for the "neuralgia" inunctions about the

aural region and neighborhood, and syringing the ear with chamomile tea.

The pain, however, increased, so much as to impel the patient to come to the aural polyclinic of Rostock on January 27, 1899.

There was bulging of the left membrana tympani. By paracentesis pus was liberated, and the pain decreased.

Fresh pain appeared in a week. February 2d the patient returned. Another paracentesis of the closed membrana tympani let out little pus. No fever. Admission to the clinic.

February 5th.—Sagging of posterior wall of external meatus. Integument of mastoid process normal.

February 7th.—**Chiselling of mastoid.** Condition: A few mastoid cells and the antrum contain a good deal of muco-pus and granulations. Bone yellow, cortex intensely sclerotic and the deeper layers softened at some places.

March 3d.—The operated wound was closed, except at a small cavity. Since February 18th the external meatus had remained dry. There occurred another bulging of the membrana tympani; upon **paracentesis,** suppuration. In spite of good drainage of the tympanic cavity, the patient still complained of intense beating in the ear.

March 12th.—The granulating bone wound was scraped as far as the antrum—without anæsthesia. In spite of this interference the wound did not show any tendency to heal.

On April 15th, under chloroform, **another thorough scraping and enlargement of the bone cavity and its softened walls** were done. The effect of this operation was not as desired. The wound did not close, and discharged numerous masses of tenacious mucus, which contained but a few pus corpuscles. In the beginning of May the patient had to be discharged to his home.

On June 19th he returned, complaining of beating and pain in the ear. From the fistulous opening behind the ear profuse purulent discharge. A great deal of pus also in external meatus. Temperature, 38° C.

Operation on the same day. Curved incision through the scar in which the fistula was situated. The granulations of the fistulous track leading to the antrum are soft and bleed a good deal. Antrum filled with granulations and pus. The granulations look lardaceous. Bony walls of cavity softened. The bony spur, remnant of the posterior wall of the external meatus,

was removed with cutting forceps as far as the tympanic cavity, which was scraped out. It contained many lardaceous granulations. Malleus and incus were loosened from their connections, but otherwise unchanged.

June 20th.—Temperature 38.8° C. Headache in frontal region, particularly in the evening. Change of dressing. After removal of plug, all at once about a teaspoonful of pus was discharged from the tympanic cavity.

June 21st.—Temperature 38.1° C. Change of dressing. After removal of plug the same amount of pus as on the day before. In wiping it away with cotton, it was seen to proceed from the *postero-inferior portion of the tympanic cavity behind the ridge of the facial.* Probing of this place reveals rough bone. Pulse 66, regular, in the evening 72. Headache less than yesterday. Background of eye normal, and also function of eye muscles.

June 23d.—Temperature, 36.8° C. Nausea, no vomiting, no disturbance of sensorium; pain in posterior half of the pharynx, where there is nothing manifesting itself distinctly. Slight horizontal nystagmus on looking to the right. Pulse, 50.

June 24th.—**Operation:**

First an attempt was made to enlarge with a sharp spoon the fistulous passage behind the facial ridge, from which pus wells out. After a lateral passive movement of the head much pus escaped through the fistula. Close above the posterior edge of the bony wound, the middle cerebral fossa was opened, the bony bridge between the normal dura exposed at this place and the original bone cavity was chiselled off and from that place the middle and posterior cerebral fossæ at the crest of the petrous pyramid were laid bare. The sinus was exposed about 1½ *cm* in length, the middle cerebral fossa in an area of almost the size of a quarter. Dura and sinus normal. There was considerable hemorrhage from an emissary vein.

The day after the operation (June 25th) no stupor, no crossed pareses. In changing the dressing, discharge of pus as before.

On deglutition, pain in pharynx and occiput. No swelling externally at the neck or in the pharynx.

June 26th.—The same conditions.

June 27th.—Icterus.

Paresis of left abducens, with corresponding double images. In looking to the extreme right, nystagmus-like twitchings.

Pupillary reaction and ophthalmoscopic condition bilaterally normal.

Now marked swelling upon the left posterior pharyngeal wall.

In the tympanic cavity, the probe enters now quite anteriorly. As above at a depth of about 1 *cm*, a bone fistula, with rough walls, upon the careful removal of which profuse suppuration ensues.

Upon incising the swelling of the pharyngeal wall, pus escapes.

June 30th.—The *place of incision of the pharyngeal abscess* is enlarged ; profuse discharge of pus.

From the fistulæ of the petrous bone less pus is discharged than during the previous days.

July 3d.—The amount of pus from the bone cavity, as well as from the abscess cavity of the pharynx, has considerably decreased. Background of eyes normal. Paresis of abducens still persists.

July 16th.—The pharyngeal abscess was healed, the paresis of the abducens had disappeared, and the bone wound was covered with healthy granulations, discharging scantily.

July 22d.—Secondary **otoplasty,** according to Stacke, was performed.

Epidermization of the cavity was completed November 22d.

L, whispered voice perceived directly in front of ear ; tuning forks from the vertex only in R E.

Re-examined beginning of January, 1900 : scar as before.

Remarks: The symptoms of the described case are those of an acute otitis media, which had begun at the end of December, 1898, and, on account of paracentesis performed too late (about five weeks after the beginning of the otitis media), had led to mastoiditis and *osteomyelitis in the spongious neighborhood of the labyrinth and in the pyramid of the petrous bone*,[1] and, as final complication, was followed by the formation of an extradural abscess above the apex of the pyramid of the petrous bone, and by a retropharyngeal abscess by gravitation.

The osteomyelitis in the spongiosa of the pyramid of the petrous bone is proven by the fistulous path which led from the posterior and anterior portion of the tympanic cavity into the pyramid of the petrous bone. The large amounts of pus emanating from these fistulæ could not

[1] Such cases were first described by Habermann. Compare Koerner, *The Purulent Diseases of the Petrous Bone*, p. 40.

alone originate from the diseased bone. That quantity which was emptied during a passive movement of the head from the posterior fistula of the pyramid could have originated from an abscess by gravitation in the deep cervical muscles. The abundant quantities which originated from the *anterior fistula of the pyramid* must have emanated from an *extradural abscess upon the apex of the pyramid* of the petrous bone. This view is supported by the simultaneous paresis of the abducens, which rapidly disappeared after the removal of the pus from this place.

32. Otitic purulent leptomeningitis and extradural abscess in the posterior cerebral fossa. Extension of pus through the ductus endolymphaticus and the hiatus subarcuatus. Granulations upon the sigmoid sinus without changes at the intima of the sinus. Autopsy.

J. Hermann, fifteen years old, suffered for ten years repeatedly from otorrhœa of the left ear, the cause of which could not be ascertained.

Six years ago, Dr. S. who now (on June 27, 1900) transferred the patient to the aural clinic, had performed an operation behind the ear. According to the report of the parents, there existed at that time a swelling behind the ear.

The patient has complained for a week of pain in the left ear without suppuration. Intense vertigo persists for four days. Two days ago, vomiting occurred followed by a chill, which was said by the relatives to have lasted a quarter of an hour. The hearing of the left ear is said to have been lost for years. A diminution of hearing in the right ear had been noticed by the patient but a few days ago.

Present condition at the admission on June 27th :

Extremely robust, well nourished young man. Sensorium free. Gait unsteady, dragging. Pulse 84, regular, strong. Cardiac sounds clear. Lungs normal. Patellar and cremasteric reflexes missing. Abdominal reflexes present. No pareses of upper and lower extremities. Both facials intact.

Behind the left ear a scar from operation, which, as well as the remaining soft tissues covering the mastoid, does not exhibit any inflammatory signs. Here no painfulness upon pressure.

Left membrana tympani reddened, dull, apparently not perforated. No pus after incision, but profuse hemorrhage. Right membrana tympani normal. Hearing of left ear apparently lost ; that of right ear much reduced.

Background of eye normal. Moderate nystagmus in looking to the right. Urine free from albumen.

After admission, vomiting occurred twice. The temperature, taken every two hours from 9 A.M. until 5 P.M., varied between 39.4° C. and 39.7° C. The patient complains of headaches and pain in gluteal region, where a place was found to be painful upon pressure, but otherwise unchanged. In the afternoon slight stupor.

In the supposition of a labyrinthine suppuration, either with beginning meningitis or with septic general infection, the **operation** was performed at 5.30 P.M. Radical operation according to Zaufal; plastic delayed.

After two chisel strokes, about 1 *cm* behind the spina supra meatum, a tablespoonful of pulsating, offensive pus oozes out mixed with white scaly shreds.

With rongeur and chisel the extremely sclerotic external wall of a large cavity filled with the above-mentioned masses and granulations is removed. The cavity extends into the antrum. In the tympanum granulations, no white scales; ossicles not found.

At the inner wall of the antrum a cavity of the size of a pea, above smooth, below sinuous, filled with granulations, which is enlarged with chisel and freed from the granulations. At the wall of this cavity two tiny circular openings are seen.

The above-mentioned scale-like masses extend posteriorly and outwardly to the sigmoid sinus, which is fully covered with granulations. The sinus and the portion of cerebellar dura located medially are fully exposed. Dura studded with blackish granulations. Region of sinus pulsating, sinus easily compressed, but refills itself upon relaxation of pressure. After operation and during the night patient quite restless.

On June 28th, opisthotonus.

Questions are answered by patient with indistinctly pronounced, incoherent, irrelevant words. In quiet moments conjugated deviation to the left is observed.

In the afternoon extreme restlessness. Jactations and hallucinations. Pupils enlarged, not reacting upon light. In the evening marked opisthotonus.

June 29th.—Extreme opisthotonus. Upper lip covered with a dense cluster of herpetic vesicles. Incontinence of urine. Constipation. Difficulty in swallowing. Margin of optic disc indistinct. At midnight exitus letalis.

Autopsy of head, June 30th, nineteen hours after death :

Cranium with bluish transparent diploë. Upon dura of convexity numerous blood drops. All vessels of dura and pia extremely filled. Pia of convexity œdematous, containing dull fluid in some of the meshes. Upon either occipital lobe under meshes of pia filled with muddy fluid, one abscess each of the size of the head of a pin, in the cerebral cortex. Region of chiasma nervi optici, pons, and medulla with purulent deposits. Pus also in the beginning portion of both Sylvian fissures. No pus in porus acusticus internus. Brain substance of good consistency with many hemorrhagic spots, without diseased areas. No sinus contains thrombi. The left sigmoid sinus, even where it is externally covered with thick granulations, is internally smooth and reflecting. Medially from sigmoid sinus, dura discolored (blackish olive green and viscid) and perforated. The centre of the discolored place is occupied by the equally discolored saccus endolymphaticus, the two sheaths of which are partly ulcerated.

From the removed petrous bone the dura is first loosened and then with the fret-saw separated about frontally in the direction of the external meatus, whereby the facial canal is transversely cut at the inner wall of the tympanic cavity, and the vestibule and cochlea are opened. Pus in vestibule. No pus in facial canal or in cochlea. The stapes plate is preserved *in situ*. The cavity at the inner antral wall is situated above the horizontal semicircular canal and extends anteriorly to the vestibule, without communicating with it. After macerating the bone by boiling in diluted liquor sodæ, it is seen that one of the tiny circular openings in the wall of this cavity leads directly into the hiatus subarcuatus. The remaining openings are small recesses.

Remarks : From the history and an observation lasting but a few hours, a labyrinthine suppuration could be diagnosed with great probability. The preceding dull, and the high continuous fever during the hours of observation further indicated an infection exceeding the limits of the petrous bone, without signs for a positive recognition of its character and location. It could be meningitis or general sepsis. Positive signs of meningitis were not present.

Lumbar puncture could have positively settled this question. Since this procedure is, according to our experience, by no means without danger in intracranial diseases, and also,

according to Jansen's experience, ***beginning*** purulent meningitis may still be cured after thorough removal of the primarily diseased area, we could not lose any time and immediately searched for the suppurating area in the petrous bone. If we were too late, we could hope to lessen the patient's pain through an operation.

The operation exposed among other lesions a cavity with granulations at the inner antral wall. Several circular openings, which could have been partly considered as opened semicircular canals, led into this cavity. The destruction at the inner wall of the antrum deprived us of the possibility of positively ascertaining the conditions present. The autopsy of the petrous bone, however, exhibited two paths through which the pus could have made its way into the cranial cavity, although we could not positively ascertain through which it had travelled. The destruction of the saccus endolymphaticus and the suppuration in the vestibule favor the view of propagation through the endolymphatic duct, the communication between the osseous cavity and the hiatus subarcuatus that of propagation through this chink. The pus may have used both pathways.

A PERSONAL EXPERIENCE OF AN ACUTE ATTACK OF AUTOPHONY.

By Dr. HERMAN KNAPP.

AUTOPHONY, as a mild and transient symptom of pharyngitis, is probably not rare. I myself, at least, have felt it occasionally, and always could make it disappear instantly by drawing the air back from my ears while keeping nose and mouth closed (negative Valsalva).

During the unusually hot and humid weeks in July, 1900, which I passed partly in New York City, partly on the New Jersey seacoast, I had an acute attack of autophony, which lasted several weeks and was so pronounced and characteristic that I thought a description of it might be read with some interest. Being reduced in flesh by an acute summer diarrhœa, but otherwise in good health and pursuing my ordinary occupation, I first noticed a strange stiffness in the walls of the naso-pharyngeal cavity, which appeared swollen and red as in an ordinary mild case of pharyngitis. The feeling was limited to the soft palate and the posterior and lateral walls of the pharynx, *i. e.*, the mouths of the Eustachian tubes and their surroundings. This cavity felt obstructed, and its walls, in particular the soft palate, stiff, starched, as if infiltrated with some hardening substance. I had the desire to free the cavity from supposed clotted mucus, but all my hawking and blowing was in vain. This condition lasted four or five days, then I grew somewhat hoarse, but my nasal respiration at the time and during the whole attack was free and there never was any discharge.

Then I noticed that repeatedly during the day the inspired air would rush into my right ear, and cause a feeling of fulness and enforcement of sound, words spoken by others and my own voice

were louder and produced an unpleasant vibration in the ear. In drawing the air back while holding nose and mouth closed, the phenomenon at once disappeared.

These attacks repeated themselves more or less frequently during a week. They were at times in the right, at times in the left, and at others simultaneously in both ears, but I could always control them by the negative (reversed) Valsalva's experiment.

In the third week the attacks were more frequent, mostly binaural, longer, and quite distressing, and I could not make them disappear any more by negative Valsalva. One evening I had to talk with a friend for two hours. All that time my ears were filled with air; the attack was at its height. The inspiratory current passed from the nasal passages directly, unimpededly, and painlessly into the lungs, but filling both ears on its way. I felt the rush of air distinctly through the tubes into the tympanic cavities, but no farther back. The striking of the air against the drumhead and the other walls of the drum produced a sonorous, somewhat whirling sensation, with no gurgling or any other sound. I was breathing not only through my nose, but also through my ears. My own voice was harsh and louder, that of my friend the same, but muffled, not so well defined. I might compare it to a microscopic specimen, magnified by a strong eye-piece, being larger, but lacking definition. This state of affairs lasted a week, then it rapidly came to an end when cooler weather set in and my health was restored. In a week I gained nine pounds in weight. The autophony has not returned since—six weeks.

During its presence I could make it instantly disappear, at first by (reversed) Valsalva, but later only by stooping or lying down. When I was in bed I always was free from it, the same when I was in the ocean, swimming or floating, and also when standing. In the mornings I did not suffer from it much — temporary spells could be at once cut short by reversed Valsalva or stooping; but in the afternoons, especially in the evening when I was tired, and more so when there was company, it was most distressing. I had no increase of temperature, my hearing was not impaired, my drumheads, which were examined by an aurist, showed no change. The walls of the naso-pharyngeal cavity were red, somewhat swollen, but there was no discharge during the whole attack.

Reviewing the case, it appears that the symptom of autophony was preceded by moderate hyperæmia, swelling,

and stiffness of the walls of the pharynx, extended in a mild degree also to the larynx. At the beginning, the autophony was only in one ear, then in both; at first in short attacks controllable by negative Valsalva or stooping, later lasting a few hours together, not relieved by negative Valsalva, and by stooping only as long as the head was thrown down. When the body was in the horizontal position it always disappeared. It caused no disturbance at night. There was no otitis connected with it. It was mild in the morning, most distressing in the afternoon and evening. It was produced by congestive pharyngitis in a system reduced and weakened by a violent attack of summer diarrhœa. Its mechanical cause was a patency of the Eustachian tubes, their easy closure being impeded by the rigidity of their walls, especially the membranous. The whole complaint was recovered from, without any treatment, as soon as the weather and the condition of the patient had changed for the better.

The text-books of otology devote but little space to the symptom of autophony. Politzer mentions it among the symptoms of secretory middle-ear catarrh (3te Auflage, 1893, S. 222). He says: One of the most distressing symptoms is the resonance of one's own voice — autophony. It disappears during treatment and rarely outlasts the recovery for a longer time. Jacobson, in his text-book (2d ed., p. 97, 1897), and especially Ostmann, in Blau's excellent *Encyclopedia of Otology* (1900, S. 40), give good descriptions of it. An elaborate article, with five cases and a full discussion of the subject, by Brunner, is published in these ARCHIVES, 1883 (Germ. ed., *Zeitsch. f. Ohr.*, vol. xii., pp. 268–282, Engl. ed., xii., p. 238, "The Etiology and Symptomatology of Autophony"). He refutes, or rather modifies, the theory according to which not only patency but also obliteration of the tube may produce autophony. It is not my purpose to repeat and discuss these arguments; all I wanted was to offer to our readers a singularly pure example of this rather strange affection.

REPORT ON THE PROGRESS IN OTOLOGY DURING THE FIRST QUARTER OF 1900.

By Dr. ARTHUR HARTMANN.

Translated by Dr. ARNOLD KNAPP.

ANATOMY OF THE EAR.

1. HAMMERSCHLAG. The origin and growth of Corti's membrane. *Verhandl. des physiol. Clubs zu Wien*, Jahrg. 1899–1900.

2. KEIBEL, F. Embryology of the labyrinthine appendix (Recessus labyrinthi or ductus endolymphaticus). *Anat. Anzeiger*, vol. xvi., No. 19.

3. RAWITZ, B. The auditory organ of the Japanese dancing mouse. *Arch. f. Anat. u. Physiol.*, Jahrg. 1899, Nos. 3 and 4.

4. GRUBER, J. A case of dehiscence at the lower wall of the bony external canal, with appearance of the jugular bulb in the aperture. *Monatschr. f. Ohrenhlk.*, 1900, No. 1.

1. According to HAMMERSCHLAG, Corti's membrane is composed of delicate fibres, which arise from the epithelium of the embryonal cochlearis, especially from those cells which later invest the limbus spiralis. The connection between Corti's membrane and terminal frame of the reticular membrane as Retzius has described it, probably persists through life. KRAUSE.

2. In the chick, the ductus endolymphaticus is not a protrusion of the auditory vesicle as in the amphibia but is identical with the stem of the auditory vesicle and communicates externally at a certain time of embryonal life. It is therefore very probable that the ductus endolymphaticus is homologous to the canal which forms an external communication of the labyrinth in the Selachia. KRAUSE.

3. RAWITZ found total deafness to exist in these animals, which turn continually like a top. The nervous unrest is thus explained. The circular canals are very much changed; the posterior and the external ones are deformed. The utriculus is quite irregular and communicates freely with the sacculus. The former opens deep in the scala tympani. The auditory cells of Corti's organ are degenerated. "The conditions found to exist in the dancing mouse oppose the existence of a static sense." The circular canals are the seat of the faculty of orientation.

KRAUSE.

4. The defect measured 6–7 *mm* by 3–4 *mm.* The skin of the canal covered the defect, but was so thin that the bulb of the jugular vein was visible. This area protruded on pressure exerted on the int. jugular vein. GRUBER has a specimen showing a small opening at the same place. KILLIAN.

PHYSIOLOGY OF THE EAR.

5. SCHAEFER. A new explanation of the subjective combination tones based on Helmholtz's hypothesis of resonance. *Arch. f. d. gesammte Physiol.*, vol. lxxviii.

6. MARAGE. The function of the buccal cavity and the ventricles of Morgagni in the formation of voice. *Arch. internat. de laryng., d'otol.*, etc., vol. xiii., No. 1.

5. SCHAEFER discusses the question, "Do vibrations and tone interruptions produce a tone sensation?" in a critical review of the existing theories, and locates the objective origin of the subjective combination tones in the labyrinth, and not in the drum membrane, like Helmholtz. BRÜHL.

6. MARAGE succeeded in making models of the shape of the buccal cavity during the pronunciation of the different vowels. He made resonators on these patterns, and with aid of König's flames produced more exact optic pictures than heretofore. These pictures were then photographed. These resonators have diverticula corresponding to the sinuses of Morgagni, which are important, according to the author, in the production of the clang tint. The resonators are to be employed in the instruction of deaf-mutes. SCHWENDT.

GENERAL.

a.—REPORTS AND GENERAL COMMUNICATIONS.

7. BLOCH. The relation of otology to the other medical sciences. Jena: Fischer.

8. GRUNERT. Historical note on the relation of otology to rhinology. *Arch. f. Ohrenhlk.*, vol. xlviii., p. 281.

9. VILLARET. Ear disease in the German army. Supplement, *Deutsche militärärztl. Zeitschr.*, 1900, p. 25.

10. STETTER. Experiences in the affections of the ear, nose, and throat. *Monatschr. f. Ohrenhlk.*, 1900, No. 3.

11. LARIONOW. Examination of hearing in the insane. *Medicinskoje Obosvenje*, Dec., 1899.

12. LJURI. Qualitative and quantitative examination of hearing in school children. *Wratsch.*, Nos. 39–43, 1899.

13. JANKELEVITSCH. On the frequency of deafness in children, its causes, effects, and curability. Bordeaux, 1899.

14. NEW YORK EYE AND EAR INFIRMARY. Seventy-ninth Annual Report, for the year ending September 30, 1899. Aural Surgeons: Bacon, Dench, Adams, Whiting, McKernon.

15. MANHATTAN EYE AND EAR HOSPITAL. Thirtieth Annual Report, for the year ending September 30, 1899. Aural Surgeons: Roosa, Pomeroy, Webster, Emerson, Hepburn.

16. NEW YORK OPHTHALMIC AND AURAL INSTITUTE. Thirtieth Annual Report, for the year ending September 30, 1899. Aural Surgeons: H. Knapp, Töplitz, Coburn, A. H. Knapp, Jordan.

7. BLOCH gives a history of otology in Freiburg. The advances made in otology by aid of anatomy, physiology, surgery, and pathology are described. "Otology is the science of a physician and not the profession of a technician." A final plea is made for admission of otology to examinations and that internal medicine in future will pay more attention to the ear.

BRÜHL.

8. GRUNERT takes issue with a statement made by an editor of a periodical that it is owing to rhinology and pharyngology that otology has become a fertile field. Otologists like Yearsley, v. Tröltsch, W. Meyer, and Voltolini, to speak only of the dead, have been the chief promoters of rhinology and pharyngology,

and a surgeon and recently an oculist have contributed to the advancement of the surgery of the accessory nasal sinuses. Grunert humorously admits, however, that the modern endonasal over-activity has produced many ear patients and has thus enlarged our aural operative field. BLOCH.

9. VILLARET adds to his previous publication that in the army most cases of disease of the external ear and drum occur in July; 40.5 per cent. of all diseases of the external ear and drum occur in June and July. This striking frequency is due to the injurious effect of bathing. Diving especially causes many cases of rupture of the drum, often with severe subsequent otitis media. Villaret thinks that diving should not be permitted. KÖRNER.

10. The report contains the description of a case of carcinoma of the lobule following a penetrating wound. KILLIAN.

11. LARIONOW'S investigations were made in Bechterew's clinic. Psychical diseases, especially those commencing with auditory hallucinations, are often associated with disease of the ears. The ear, nose, and naso-pharynx should be carefully examined and treated, whereby psychic disease can more readily be cured. An interesting fact brought out by the author is that in the diseases beginning with marked psychical defect, as the secondary insanity or dementia, the musical faculty of the cerebral cortex remains intact. It is therefore probable that a particular centre for the musical faculty exists in the cerebrum.

SACHER.

12. LJURI examined carefully 300 children of both sexes with the following results: 1. In $\frac{1}{3}$ of the school children between eight–fourteen years old hearing for whisper was 30 metres, and in $\frac{2}{3}$ it was more than 20 metres. 2. 18 per cent. of the 300 children must be regarded as hard of hearing, as a minimum hearing distance for whisper is 15 metres. 3. The lower tone limit in school children is situated between C II and E II. 4. The upper limit is between 0.1 and 0.2 of the Edelmann-Galton whistle. 5. Bone- and air-conduction in children with normal hearing organs within 7 octaves is not shortened. 6. Rinne's test must be positive. 7. In Weber's tests the answers are contradictory. 8. Inspissated cerumen occurs more frequently in girls. 9. Crescentic opacities of the drum, passing from the short process down and back, are frequently seen in children who have had measles. 10. Deposits of lime are rare in school children. 11. Otorrhœa was present in 5 per cent. 12. Adenoids in 27 per cent.; of these

⅓ were likewise affected with middle-ear troubles. The other observations are not new. SACHER.

13. JANKELEVITSCH dwells upon the frequency of deafness and regrets the retarded seeking of medical help. The statistical tables of Bezold, Gellé, and of Moure are used.

Moure found among 3588 school children that 17 per cent. do not understand loud conversational voice at 5 metres. According to Moure a normal ear should comprehend a loud dictation at 10 metres.

The reviewer has also come to the conclusion that examination of school children with the whisper voice of Wolf or Bezold or with acoustic instruments is not practicable, and recommends Gellé's method (writing down of a loud-spoken dictation). This method takes the least time and is capable of determining whether the pupil can pursue his studies or not. SCHWENDT.

14. Number of patients, 8362; operations, 1065; paracentesis of membrana tympani, 320; ossiculectomy, 19; opening of mastoid cells, 186; Stacke operation, 3; operation for thrombosis of sigmoid sinus, 6; for thrombosis of jugular vein, 2; for epidural abscess, 19; for cerebellar abscess and excision of internal jugular vein, 2; removal of adenoids, 152; removal of granulations and polypi from middle ear and auditory canal, 260.

15. Number of ear patients, 3251; throat patients, 3198; ear operations, 257; operations on nose and throat, 1000; opening mastoid cells, 67; opening lateral sinus, 2; paracentesis of membrana tympani, 22; cerebral abscess, 2; removal of granulations and polypi, 39; ossiculectomy, 2; operations for adenoids, 444.

16. Number of ear patients, 1245; of nose patients, 1686; operations, 529; removal of granulations and polypi, aural, 35, nasal, 27; paracentesis of membrana tympani, 89; ossiculectomy, 2; opening mastoid cells, 28, one exploratory in a child having serous meningitis (tubercular); incision for furuncle of auditory meatus, 19; removal of adenoids, 137; of faucial tonsils, 56.

J. B. CLEMENS.

b. —GENERAL SYMPTOMATOLOGY AND PATHOLOGY.

17. HALSTEAD, T. H. The significance of earache in children. *Med. News*, March 17, 1900.

18. EULENSTEIN. Diseases of the ear in diabetes. *Deutsche Arch. f. klin. Med.*, vol. lxvi.

19. CASTEX. Acquired syphilis of the ear canal. *Bulletin de laryng., otol.*, etc., May, 1900.

20. PIFFEL. Tuberculous otitis with tumor-like protuberance in the cranial cavity. *Zeitschr. f. Heilk.*, vol. xx.

21. HAIKE. Contributions to the pathology of the middle ear and labyrinth. *Arch. f. Ohrenheilk.*, vol. xlviii., p. 228.

22. LOHNBERG. A case of punctured wound of the ear with escape of cerebral fluid. *Münch. med. Wochenschr.*, No. 3, 1900.

23. ZERONI. On carcinoma of the ear. *Arch. f. Ohrenheilk.*, vol. xlviii., p. 141.

17. Conclusions: (1) Earache in children is generally caused by acute inflammation of the middle ear, suppurative or catarrhal. (2) Infants and young children may have suppuration in the middle ear without giving satisfactory evidence of pain, or without rupture of the drum-membrane. (3) In the absence of other known causes of pain, from which a child is suffering, the first cause to be thought of should be acute otitis media, and this calls for an examination of the drum-membrane. (4) It has been shown by examination of the middle ear, during life and post-mortem, that purulent otitis media is nearly always present in acute infectious diseases of the gastro-intestinal and respiratory tracts in young children, especially in gastro-enteritis and broncho-pneumonia, to which diseases it probably stands in a causative relation. (5) The cause of death in many acute and chronic infectious diseases, in meningitis, and in the exanthemata, is the result of unrecognized and untreated abscess of the middle ear. (6) Repeated earaches in children are ordinarily but a sign of acute exacerbations of a chronic otitis media resulting from adenoids. (7) In adult life, so-called catarrhal or progressive deafness is often but a final stage of the otitis media which had its beginning in early childhood, when it was due to adenoids and practically curable. J. B. CLEMENS.

18. EULENSTEIN refers to the frequency of diseases of the external canal in diabetes, and states that affections of the internal ear, as well as catarrhal processes of the tube and middle ear, are not especially influenced by sugar in the urine. The relation of purulent otitis media and diabetes are treated in detail. A careful review of forty-six cases of purulent otitis in diabetes mentioned in literature, one case personally observed, and three of Körner's, lead the author to conclude that there is no etiological connection

between diabetes and middle-ear suppuration. The rapid destruction of the mastoid process, which is regarded by some authorities to be characteristic for diabetic otitis media, may also occur in other general diseases, as influenza, pneumonia, scarlet fever, in which the resistance has suffered by the severity of the infection. The causes which may unfavorably influence the otitis in diabetes, and bring on severe complications, are: (1) the anatomical structure of the mastoid process; (2) the favorable soil produced by diabetes for pathogenic agents of various kinds; (3) the frequent arterio-sclerosis, inducing poor nutrition; (4) the severity of the infection. DENKER.

19. CASTEX has observed seven cases, and concludes as follows: Acquired aural syphilis occurs usually in man, wherein it differs from congenital syphilis. Prognosis is worse the earlier the aural symptoms appear after the chancre. The cases where the inner meatus is affected are unusually grave. Treatment is the usual one, combined with pilocarpin injections.

20. PIFFEL reports on the pathological anatomy of a temporal bone from a man, fifty-five years old, who suffered from cerebral atrophy, chronic pulmonary and bronchial gland tuberculosis, purulent bronchitis, lobular pneumonia, and chronic tuberculous ostitis of the left petrous bone, and died in an insane asylum. No examination in the living had been made. The lining of the left external meatus was thickened, destroyed near the drum, and partly transformed into granulation tissue. The changes in the bone were very extensive. Almost the entire upper and posterior wall of the bony canal was wanting, the lower anterior wall presented a defect including the floor of the tympanum and exposing the maxillary joint. Drum, ossicles, tegmen tympani, and pars epitympanica were missing; a granulation the size of a pea occupied the round window. Large defects in the mastoid process, and at the upper and posterior surface of the pyramid. On the destroyed tegmen tympani there is a tumor as large as a walnut, composed of dura, with many small nodules on the surface; the dura on the posterior surface is 2 *cm* thick. The lumen of the sigmoid sinus, which is in places very closely connected with the proliferation, and the jugular bulb are obliterated. The cartilaginous part of the tube is unchanged; the carotid contains fresh blood coagulum. Histologically the tumor shows a tuberculous structure; miliary tubercles, giant cells, and tubercle bacilli were present. The inner tympanic wall was rough, covered with granu-

tation tissue, and contained lacunæ, filled with new inflammatory tissues. The process had passed through the two windows and the Fallopian tube to the labyrinth. The middle ear and cochlea also communicated by a canal at the floor of the cavity. The nervous end apparatus was destroyed, except a part in the upper turn; tuberculous granulation tissue replaced the vestibule, ampullæ, and circular canals. Miliary tubercles were found in the facial and acoustic nerves. The infection had passed by way of the Eustachian tube from the naso-pharynx to the tympanum, and the tegmen tympani to the dura, where it came to a stop.

DENKER.

21. Left-sided otorrhœa, following diphtheria in childhood. Radical operation. Wound healed in six weeks. At a later period a granulating point appeared on a semicircular canal, which enlarged and contained tubercle bacilli. The three ossicles were removed at time of operation in a single granulating mass, and all were found carious. There was new-formed bone at the stapes plate. According to the author, caries of the stapes plate is almost always tuberculous. In this case no other tuberculous focus was present. BLOCH.

22. Punctured wound in the canal with hat-pin. Subsequent vertigo, vomiting, retardation of pulse, and moderate discharge of a serous fluid for about ten days. Perforation in the posterior upper quadrant. Recovery, with good hearing. LOHNBERG believes that the pin punctured the tegmen tympani, and opened the subarachnoid space. SCHEIBE.

23. ZERONI relates five cases from Schwartze's clinic. Etiology, diagnosis, symptomatology, pathology, prognosis, and treatment are carefully discussed with aid of literature, from which 121 cases are collected. Four photographs are added.

BLOCH.

c.—METHODS OF EXAMINATION AND TREATMENT.

24. WAUNER. Diagnosis of one-sided deafness.

25. RÖHR. The physical determination of one-sided deafness. *Deutsche med. Wochenschr.*, No. 2, 1900.

26. LUCAE. The physical determination of one-sided deafness. *Deutsche med. Wochenschr.*, No. 7, 1900.

27. HUMMEL. The proof of one-sided deafness. *Deutsche med. Wochenschr.*, No. 7, 1900.

28. BONNIER. "La pointure acoumetrique." *Arch. intern. de laryg., d' otologie*, etc., vol. xii., No. 6.

29. MAHU. Examination of the ear in accidental stenosis of the canal. *Arch. intern. de laryng., d' otologie*, etc., vol. xiii., No. 1.

30. GRADENIGO. Radiograph of a bullet in the ear. *Archiv. ital. di Otologia*, etc., vol. ix., p. 237.

31. ZERONI. A new instrument to remove the incus from the canal. *Arch. f. Ohrenhlk.*, vol. xlviii., p. 191.

32. STILLSON, HAMILTON. Extension massage of the ossicles with a new aural masseur. *Journal American Medical Association*, Jan. 20, 1900.

33. OATMAN, E. L. New ear basin. *New York Medical Journal*, Jan. 13, 1900.

34 EULENBURG. A new instrument to apply vibratory massage. *Deutsche med. Wochenschr.*, No. 10, 1900.

35. PEWNIZKI. Ferripyrin in ear disease. *Wojenno medizniski Shurnal*, October, 1899.

24. One-sided deafness can be determined by Bezold's continuous-tone series; all previous methods are unreliable. The functional examination showed that the hearing range (apparent) of the ear without a labyrinth gave an image necessarily faulty of the hearing ability of the other side. Characteristic was: (1) that the lower tones to a'' were not heard; and (2) that the values which were found for the hearing duration in percentages showed a gradual step like ascension from a'' to fis^4. In one case the ear without a labyrinth showed a hearing duration for a'' of 12 %, for f^3 20 %, for c^4 29 %, for fis^4 52 % of the normal hearing duration. Patients were selected for examination where one ear was deaf and the other normal, and where one ear was deaf and the other somewhat affected. It was found that the tones a'' and f^3, if the perception for these was reduced to 50 % of hearing duration, = 0.051 true hearing value of the better hearing ear, were no longer heard by the deaf ear, *i. e.*, that they were not conveyed over to the other ear. That higher tones are not perceived by the deaf ear, but by the other closed ear is proven by the fact that certain tones are very much shortened or not heard at all by the deaf ear if they are heard for too short a period by the better hearing ear to be transmitted from the deaf ear, while other tones which are unusually long perceived by the hearing ear are

heard for an unusually long period by the deaf ear. Diagnosis of one-sided deafness depends on the following conditions:

(1) When speech is not heard and perceived as well in Lucae-Dennert's test with both ears closed as when the affected ear is open.

(2) When the lower tone limit is at a″ or thereabouts.

(3) Weber's test with A and a′ is lateralized to the sound ear.

(4) Schwabach's test proves negative, granted that no middle-ear process is present.

The most reliable points are furnished by (5) the test of hearing duration if the latter shows the above-described ascension and when certain tones are very much reduced on the good side and corresponding shortening or absence for the same tones on the affected side are noticed. DENKER.

25. RÖHR has experimented with the interference otoscope of Lucae for the diagnosis of one-sided deafness, to verify the latter author's results. He has employed only intelligent persons and has followed Lucae's directions closely but was able but partly to confirm his results. A positive result was obtained but once,—increase of the tone on the sound ear in connection with the long tube when the short tube was placed in the deaf ear, while the vibrating tuning-fork, according to directions, was screwed tight in the horizontal branch of the T-shaped interference tube. The opposite was noted once. Of interest was the observation that a patient noticed an increase of tone in the left ear as soon as the short tube was introduced in the right one. According to Lucae the right ear should have been deaf, but the examination showed that both ears were equally and relatively good. NOLTENIUS.

26. LUCAE criticises the above article and states that the C and not the A fork was used, and the long tube was 3 *cm* too long. Lucae claims that his method was only applicable for one-sided hardness of hearing or deafness for deep tones, and is perfectly reliable if properly applied. NOLTENIUS.

27. HUMMEL has two persons speak into tubes tightly fitting in each ear. Short sentences of the same, similar, or quite different contents are spoken simultaneously and with the same intensity, and are to be repeated by the patient. The one-sided deaf will always repeat correctly while the simulator will not be able to separate the various impressions. NOLTENIUS.

28. BONNIER endeavored to find a simple manner of recording the hearing tests, and had Collin make a tuning-fork of 100 v. d.

The method depends on the following physiologic optical facts: A tuning-fork, whose stem is held in the hand, is set in vibration so that the small surfaces of the branches are turned to the observer's eye, and the free surfaces turn in a quarter-circle. The picture of the fork when it ceases vibrating is a surface, while if vibrating striped in fan-shape. This is more noticeable if a shining metal needle is fastened to the metal branch. It is necessary to see how many seconds elapse after the time when fan-shaped stripes are no longer visible, and that point when the normal ear no longer hears the vibrating fork.

If, for example, a normal ear hears the vibrating tuning-fork for n seconds after the striped figure is no longer recognized by the eye, then the normal hearing is + n seconds. A perception which is less than this normal duration is pathological and either + n − m seconds or ± o, or equals − n seconds.

This method may be combined with Gradenigo's, which was published at the last congress and consists in replacing the needle by a figure.

Another experiment of Bonnier's is to determine the hearing perception of a fork placed on the patella. Bonnier has thus been able to discover a beginning deafness in conditions where other methods failed. This has reference to diseases of the sound-conducting apparatus alone. SCHWENDT.

29. It is usually very difficult to examine the drum in cases of stenosis of the external canal following eczema or furuncle. MAHU has had constructed an instrument (speculum dilatateur) to overcome this difficulty. SCHWENDT.

30. In GRADENIGO's radiograph the projectile is seen next to the labyrinth wall near the carotid canal. GRADENIGO.

31. This instrument is a disc of polished steel wire at right angles to the stem, which prevents the escape of the incus in the direction of the antrum. This incus is forced to the floor of the tympanum, whence it is then extracted. BLOCH.

32. This instrument, which is minutely described, was devised to meet a requirement in which other masseurs were considered deficient. It is the means of putting anchyloses, or adhesive bands, on the stretch, while such anchyloses are being vibrated. Under its use tinnitus, not due to congestion, is quickly relieved, and the hearing distance, in suitable cases, increases steadily. In old and very chronic cases the application must be repeated for a

long time. It is found beneficial in cases hitherto considered hopeless. J. B. CLEMENS.

33. This new basin designed by OATMAN has a hollow handle which projects above the bottom, acting as a trap. The solid matter is retained, while the overflow passes through the handle to any convenient receptacle. J. B. CLEMENS.

34. This new modification of the old apparatus for vibratory massage consists of the interposition of an air-tight quantity of mercury which is set in motion by the rotating-waves and in turn gives a number of regulatable movements to the massage appliance. NOLTENIUS.

35. Ferripyrin, a combination of ferrun sesquichloratum and antipyrin is an orange-red powder soluble in water. PEWNIZKI has used this in forty-five cases, grouped in three classes according to the nature of the ailment. In the I. group there were fifteen patients, acute catarrhal and purulent perforative otitis; in II., eighteen cases of otitis med. purulenta chronica ; and III., twelve cases where, besides the chronic discharge, granulations or polyps were present. Ferripyrin was employed in 1–20 % watery solution, and dropped into the ear. In the fifteen patients of the I. group the discharge ceased in twelve ; of these twelve the perforation had closed in eight and become smaller in four. In the other three cases discharge remained. In the II. group the result in nine was negative, in eight otorrhœa ceased in sixteen days. In the III. group the result was negative in five, in the others the conditions were somewhat improved.

The favorable action of ferripyrin is certain but depends upon the character and severity of the disease. It acts weakly astringent, disinfectant, and resorptive. SACHER.

d.—DEAF-MUTISM

36. SCHEPPEGRELL, W. A critical summary of literature on the influence of heredity on deafness. *Am. Journ. of Med. Sciences*, Feb., 1900.

37. HUTH, ALFRED H. Consanguineous marriage and deaf-mutism. *Lancet*, Feb. 10, 1900.

38. MÉNIÈRE, CASTEX, and GROSSART. Medical examination of the new cases at the National Institute for Deaf-mutes. *Bullet. de laryngologie, otologie*, etc., Dec. 30, 1899.

39. SCHWENDT. Examination of deaf-mutes. *Wien. med. Presse*, No. 43, 1899.

40. TREITEL. On the value of hearing exercises in deaf-mutes. *Therapie der Gegenwart*, March, 1890.

36. SCHEPPEGRELL reviews the literature, opinions, and theories from the earliest writings up to the present time, and submits a table of statistics showing the number of deaf-mutes in different countries. The relation of deafness and mutism was not realized until the latter part of the sixteenth century; then it was learned that the faculty of hearing was necessary for the development of speech. The subject is divided into two classes: first, congenital, and second, acquired deafness. Hearing is absolutely lost in about 39.7 per cent. of the congenitally deaf, though noises of great intensity are apparently heard and transmitted through the nerves of general sensibility. Accidents accompanying instrumental delivery add to the many difficulties in distinguishing between congenital and acquired deafness. It appears that one half the cases of deafmutism develop before the fourth year.

The question of intermarriage of deaf-mutes is dwelt upon. Where both parents were deaf-mutes 13.3 per cent. of the offspring were afflicted against 6.8 per cent. where but one parent was deaf. As a predisposing cause consanguineous marriage is looked upon by some as responsible for 25 per cent. of the cases of deafmutism; by others the percentage is placed as low as 6. Even when there appears no hereditary predisposition to deafness, such marriages have a marked influence on the propagation of deafmutism. J. B. CLEMENS.

37. HUTH has carefully considered many statistics in reference to this interesting question, and deduces that "Although, however, there is no evidence that consanguinity produces deafness, or, indeed, as I have shown in my 'Marriage of Near Kin,' any other disease, it is not advisable on the grounds of heredity for a deaf person to marry a relative when there is deafness or even a tendency thereto in the family."

His paper must receive careful attention.

ARTHUR CHEATLE.

38. The examination showed the following result: Middle-ear disease was of only slight influence on the deafmutism. Six of 24 cases showed changes in the middle ear, adenoid vegetations were present in 5 cases. The central nervous system seemed to be the main locality for the morbid changes which produced the deaf-

mutism. Sixteen cases were congenital, the acquired form showed a much lesser degree of deafness. One child only came from deaf-mute parentage ; in 4 cases the parents were consanguineous. A marriage between cousins produced 13 children of whom 3 were deaf-mutes. Many of the children came from poor, ill-ventilated dwellings. LEDRY.

39. The deaf-mutes possessed all the remnants of hearing which could be discovered in them, before any systematic hearing exercises had been made.

An improvement was present at each new trial. In those deaf-mutes whose hearing fields are as large as those not deaf-mutes, but hard of hearing, there is a possibility of improvement to the point of understanding conversational voice, and even without real hearing exercises, though the latter would undoubtedly be of some benefit. POLLAK.

40. According to TREITEL a definite opinion on the value of hearing exercises in deaf-mutes cannot be given at present. HARTMANN.

EXTERNAL EAR.

40. LERMOYEZ. Treatment of eczema of the auricle. *La presse médicale*, No. 1, 1900.

41. SARREMONE. Facial neuralgia of aural origin. *Arch. internat. de laryngol., d'otologie et de rhinologie.* Tome xii., No. 6, Nov.–Dec., 1899.

42. PASSOW. Fracture of both external auditory canals from a fall from a bicycle. *Monatschr. f. Unfallheilkunde.*

43. SCHWARTZE. Acquired atresia and stricture of the auditory canal and their treatment. *Arch. f. Ohrenhlk.*, vol. xlvii., p. 71, and vol. xlviii., p. 261.

40. LERMOYEZ discussed aural eczema from the clinical standpoint. As regards treatment he is eclectic. In the application of every local treatment the individual susceptibility for each drug must be regarded. "Il faut respecter les caprices de chaque peau." SCHWENDT.

41. SARREMONE observed unusually severe facial neuralgia in several cases which disappeared after treating the eczema of the auditory canal. SCHWENDT.

42. A fall on the chin caused a hole to be made in both bony auditory canals ; the middle and inner ears were unaffected.

The lower jaw was immobilized with a bandage. A fragment of bone ½ *cm* long and broad was removed after it became loose. Recovery without stricture of canal. BRÜHL.

43. Twelve cases of atresia of the auditory canal are reported as the result generally of previous mastoid operations. The author gradually comes to the conclusion that the radical operation was necessary for permanent cure. In seven cases there was a cutaneous or bony-cutaneous stricture. Eleven cases were operated upon; in two of these, the radical operation was not done, and a stricture again appeared, though in one after an interval of six years, produced by new bone formation of unknown cause.

SCHWARTZE emphasizes the importance of retracting the auricle, and making a large operative field.

BLOCH.

(*To be concluded in next number*).